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EXCAVATING ENGINEER

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About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

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How an enterprising Chicago contractor made over Nature's handiwork to his liking to create beautiful resort near Wisconsin Dells.

Good Mixers.
Great Lakes Coal and Coke Company uses two clamshell-cranes to unload, load and mix coal and coke at Port Newark.

Excavating Belgium's Albert Canal
Involving excavation of some 100,000,000 cubic yards, this is the longest canal project at present under construction in Europe. Part of canal across low country carried between embankments supported by curtain of sheet piling within which cement has been injected into ground to provide a firm and impervious foundation.

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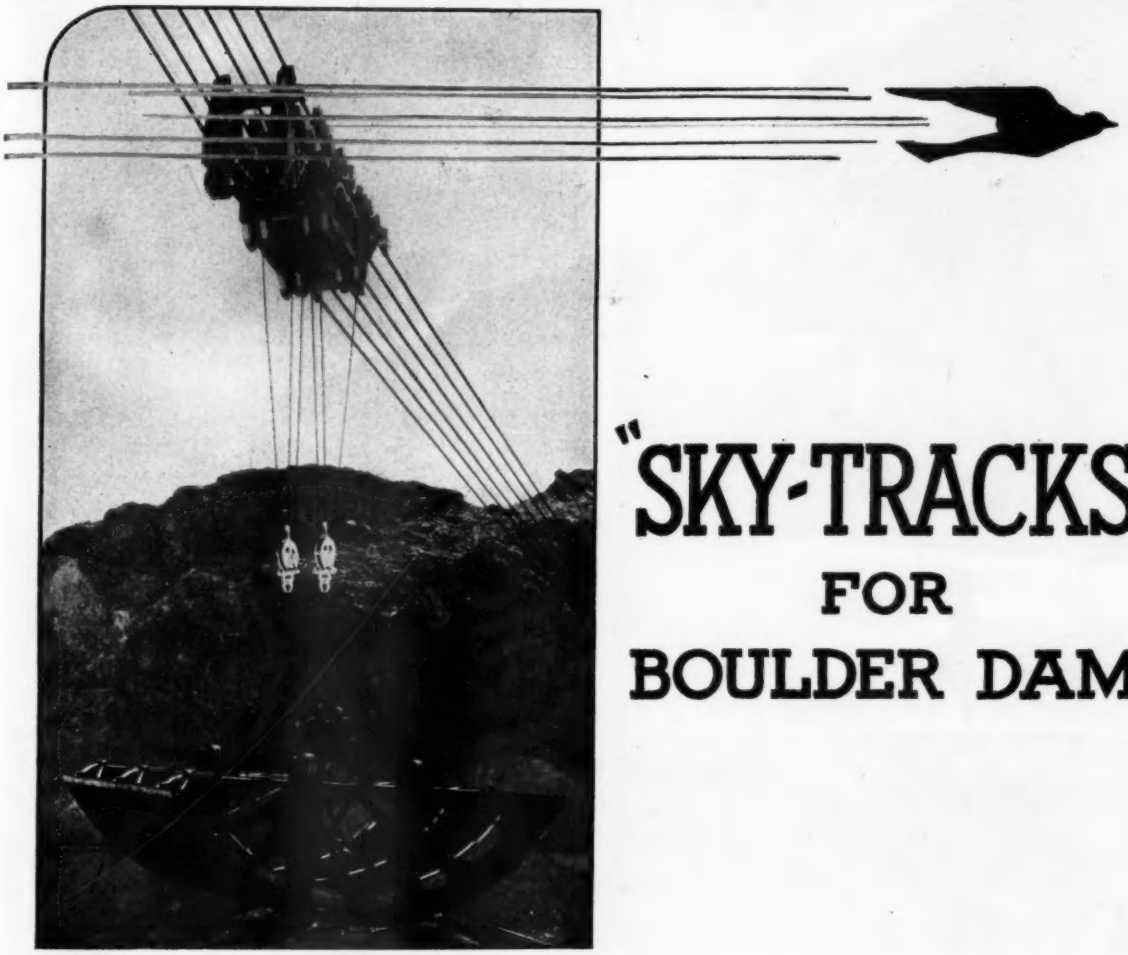

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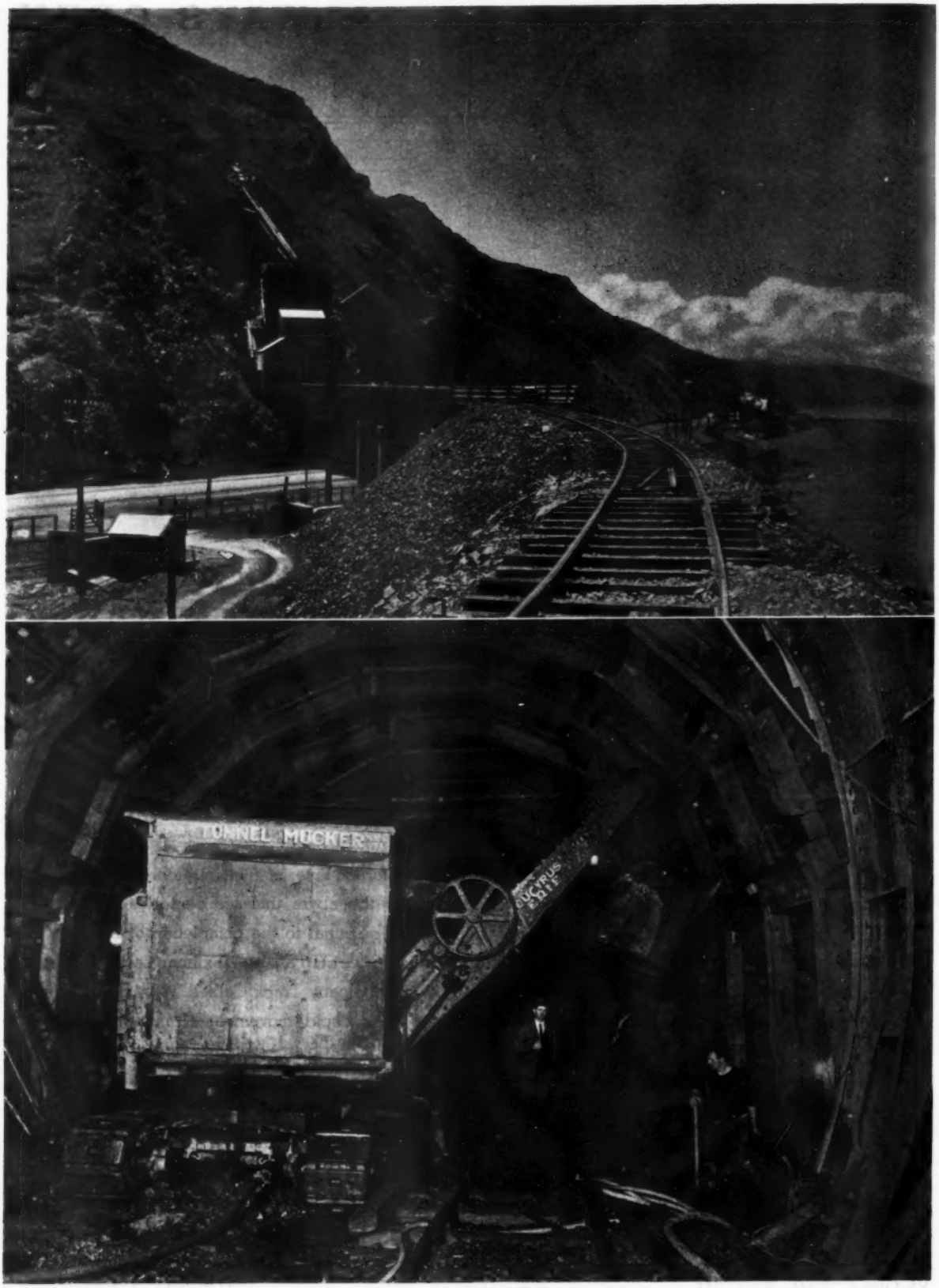

Above: At the Wellington end the tunnel opens on to the Hutt Road overbridge. The concreting plant is built over the portal. Notice the familiar Mobiloil sign alongside this New Zealand highway just at the left of the railroad bridge. Below: Bucyrus-Erie air-operated tunnel shovel excavating in No. 3 Portal. Note the tunnel timbering.

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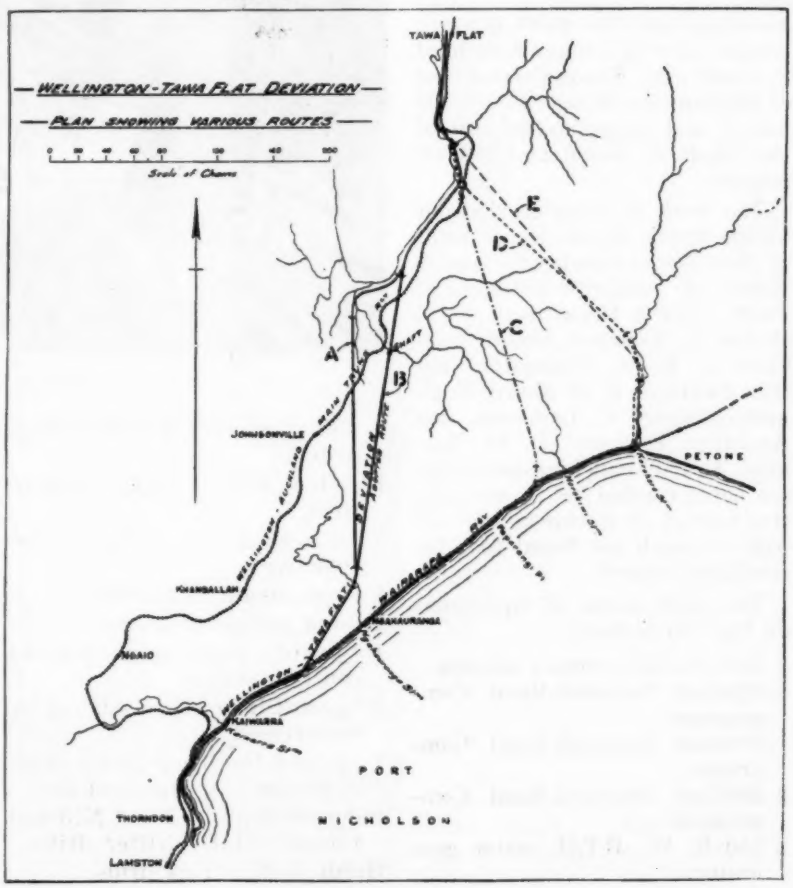
Excavating the TAWA FLAT TUNNEL

Two 26 by 20-foot tunnels totaling 18,169 feet in length shorten railroad and cut down grades between Wellington and Tawa Flat, New Zealand.

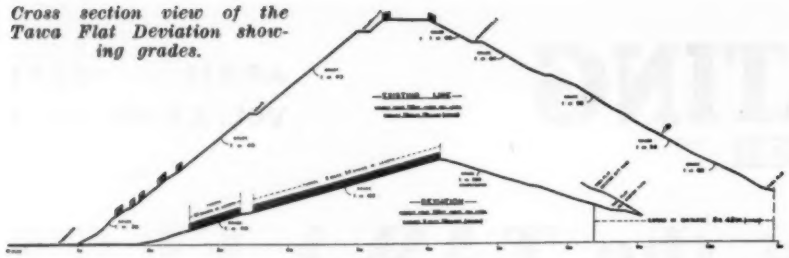
THE PUBLIC WORKS Department of New Zealand is carrying on interesting tunneling operation on the government owned and operated Wellington to New Plymouth Railroad between Wellington and Tawa Flat. The work consists of a deviation 7¼ miles long which shortens the distance by 2½ miles and cuts the grades going north from one in forty up on the old line to one in one hundred ten up on the new line and from one in 56 down on the old line to one in one hundred down on the new line.

The Tawa Flat deviation leaves the present line of railway at a point about 1¾ miles from Wellington and starts to rise immediately, skirting Wellington Harbour for about ¾ mile on an embankment formed with spoil from the tunnel, then crosses the main highway leading out of Wellington, by means of an overhead bridge and enters No. 1 tunnel. The line leaves this tunnel in Ngahauranga Gorge, crosses the highway again on an overhead bridge and then enters No. 2 tunnel. At No. 4 Portal the line strikes the Porirua Stream, which empties into Porirua Harbour, and follows down this stream until it joins the present line about 3 miles further down. The country traversed consists of steep hills with practically no flat land until the junction is made with the old line.

The principal part of the work consists of the long tunnel, or rather two tunnels for it is broken by Ngahauranga Gorge, through the range of hills which encircle Wellington Harbor. These hills run from 600 to 1500 feet high. The new road cuts through them with the two double-track tunnels approximately 26 feet in width by 20 feet in height inside the lining. No. 1 tunnel is 4064 feet long, built on a grade of one in one hundred ten; No. 2 is 14,105 feet long and built on a grade of one to one hundred twenty-two. Coming out of this second tunnel at an elevation of 195 feet above sea level the line continues in the open dropping down a grade of one in one hundred (compen-



General plan showing the route of the tunnel. The four routes considered in the final investigation are marked A, C, D and E. The adopted route is marked B.



Cross section view of the Tawa Flat Deviation showing grades.

sated) to Tawa Flat. The new line will permit a considerable saving in hauling cost and also relieve congestion which on the old line had become a serious problem owing to the heavy volume of freight, suburban and long distance passenger trains.

470,000 Yards of Tunnel Excavation

The material being excavated, totaling some 470,000 cubic yards, is of sedimentary origin and consists mainly of greywacke, a cemented and welded sandstone. The country has been subjected to extensive earth movement and the earth is much broken varying from a very hard to a soft pug. The estimated cost of driving the tunnels is 964,000 pounds and the estimated cost of the whole deviation is 1,283,000 pounds.

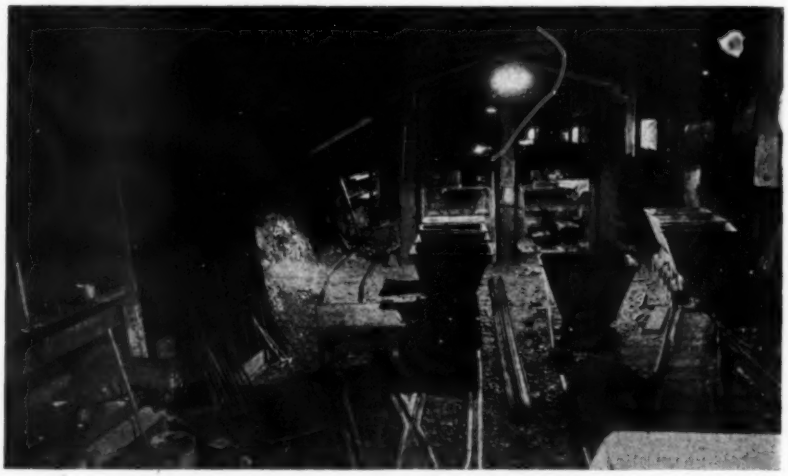
The work is being carried out by the Public Works Department of New Zealand under the supervision of Engineer-in-Chief of Public Works Department C. J. McKenzie, Assistant Engineer-in-Chief J. Wood, Wellington District Engineer H. H. Sharp, Engineer-in-charge C. Langbein, and Assistant Engineer D. O. Haskell. Actual tunneling operations are being carried out by cooperative parties of workmen who are paid so much per lineal foot for completed tunnel.

The main items of equipment on the job include:

2 Bucyrus-Erie tunnel shovels
6 800-foot Ingersoll-Rand Compressors
1 600-foot Ingersoll-Rand Compressor
2 300-foot Ingersoll-Rand Compressors
2 150 K. W., B.T.H. motor generators
10 motor generator sets for battery charging
A large number of electric motors, all of British makes, ranging in size from 160 H.P. to 5 H.P.
4 centrifugal and 8-air pumps
3 fans with 18 H.P. motor to deliver 3200 feet of free air per minute against a water gauge of 17 ins.
1 electric lift
2 12-ton G.E. electric trolley locomotives
4 4-ton G.E. electric trolley locomotives
12 4-ton G.E. battery locomotives
5 4-ton English E.C. battery locomotives
1 8-ton steam locomotive
1 4-ton petrol locomotive
4 ½-yard Armstrong - Holland concrete placers
4 ¼-yard Hoar shovels driven by compressed air
1 ¼-yard Nordberg-Butler shovel driven by compressed air
Ingersoll-Rand N72 and N75 and Climax C.L.D. drifter drills
Hardy W.B. 6 rock drills
Ingersoll-Rand and Hardy pneumatic picks
6 Ingersoll-Rand Little Tugger & Gardner-Denver, Leadville, air hoists
2 Leyner driller sharpeners
4 Coke Drill forges
2 Pedestal Grinders
Fitters' Workshop equipped with machine tools.

Method of Tunnel Excavation

A cross section is shown in the drawing in the center of page 172. It makes provision for a double track railway at 12-foot centers and has sufficient headroom for overhead equipment when electrification is undertaken. The unit quantities in the section are 23½ cubic yards of excavation and 5½ yards of concrete lining per lineal foot, allowing for 5% overbreak.



View in the tunnel at the bottom of the shaft.

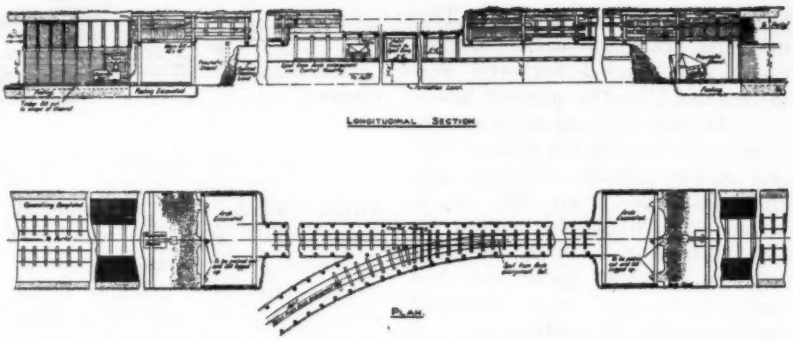
The method of operation follows the American system of timbering and the excavation of a central heading, then the arch, followed by the mucking out of the main tunnel with the ¾-yard Bucyrus-Erie shovels. The use of the central heading permitted the arch to be enlarged from the top, the spoil rilling into trucks in the heading, the crown piece of timber being set first and the remainder being put in as the arch is broken out. Where the ground is too broken to support the timber, a longitudinal sill is used. The bench is then shot and the spoil loaded out by one of the ¾-yard shovels. As the excavation of the bench progresses,

each section is supported by timber columns placed either under the sill or directly under each arch. Experience has demonstrated the necessity of cutting and fitting all the timber accurately for on the full bearing surface depends the strength of the work.

Excavating Tunnel No. 1

In the short No. 1 tunnel, which was excavated first, owing to the limited head room unavoidable, owing to the extra heavy timbering required, it was impossible to use the larger air shovels and two ¼-yard Hoar machines were used in each face.

As the heading progressed in No. 1 tunnel, the ground became very soft and broken and tended to be heavy even in the 8x10 central heading. Likewise a large number of pockets were tapped and practically the full length of the tunnel was driven under wet conditions. For several months approximately 16,000 gallons per hour were pumped out of the adits and 12,000 gallons per hour flowed from No. 1 portal. These unfavorable conditions made it advisable to work number one tunnel with the bar system of timbering, 9 hardwood bars being used, and the tunnel was taken out in 16′6″ lengths, although at times it was found necessary, owing to excessive weight, to reduce this to 12′ lengths. In this type of timbering no reliance is placed on the ground, the whole of the bars being "tommed" up off the sill which is carried on 14″x14″ legs.



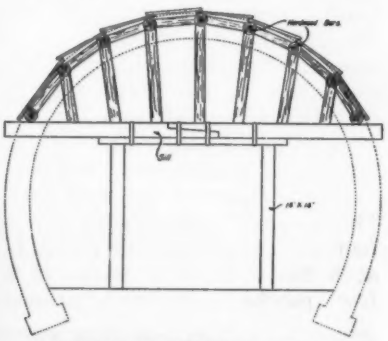
These sections show the proposed general scheme as drawn up for driving the No. 1 tunnel.

Shaft Speeds Excavation No. 2

The second and longer tunnel was then excavated using the Bucyrus-Erie tunnel shovels.

A shaft 125 feet deep was located 3500 feet from No. 4 portal and from it, central headings were driven both ways until they met the headings from the portals. The material excavated from these shaft headings was hand loaded into ¾-yard trucks and taken out through the shaft to be dumped into a convenient gully. The shaft was fitted with a standard Waygood-Otis lift with two cages carrying a maximum load of 3500 pounds at a speed of 125 feet per minute. The shaft was used until the last possible moment for disposing of material excavated from the arch of the tunnel by the party working from No. 4 portal.

In driving, the central heading is driven through by hand first, located as shown in figure in the middle of the following page, so that the top of the hauling equipment will come at the approximate level of the bottom of the arch section. Then the arch is broken down into this central heading, being loaded by small ¼-yard shovels and hauled out through adits. After the arch is timbered then the main section of the tunnel is excavated to full dimensions, the material being loaded out by the ¾-yard shovels.



Method of timbering arch in No. 1 Portal.

Between the shaft and No. 3 portal, there are 2 miles to penetrate, and from the latter point it was essential that both heading and enlargement should progress together. Therefore a pioneer heading was driven for about a mile, a chain to the left of the centre line of the tunnel. Down this right-of-way passed

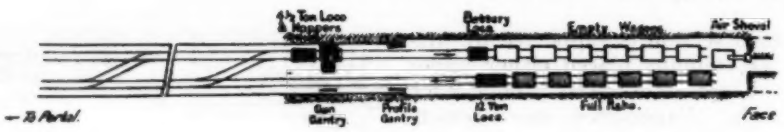
Excavating muck from the heading. Note timbering.

the spoil from the heading. The material from the arch enlargement was hauled forward and sent around by the pioneer heading. All the services, such as air, water and ventilation pipes, were laid in the pioneer heading, and the drainage from the work ahead was diverted through it. The formation level of the side heading is 1 foot lower than the main drive, and cross cuts are put in every 10 chains.

As the heading is at a different level from the enlargement, two roads out are necessary for spoil haulage. This is very advantageous according to the engineers in that it keeps the three operations—(1) driving and heading, (2) arch enlargement, (3) excavation of the walls and footings — independent of each other thus allowing a better progress to be made.

Drilling and Blasting Problems

Owing to the variable nature of the ground no fixed system of locating the drill holes could be adapted. The number of the holes in the 8x10 foot heading varied from none to 26 and their arrangement and number was left to the judgment of the shift boss. The average round pulled was 5 foot as timber sets were put in at 5 foot intervals, except in a few patches of hard ground which were left untimbered. Nobel's 60% gelignite was used throughout for blasting except for a little 90% gelatine dynamite used in the cut holes when traversing hard ground.



Not to Scale.

Sketch plan showing method of hauling from the ¾-yard shovels.

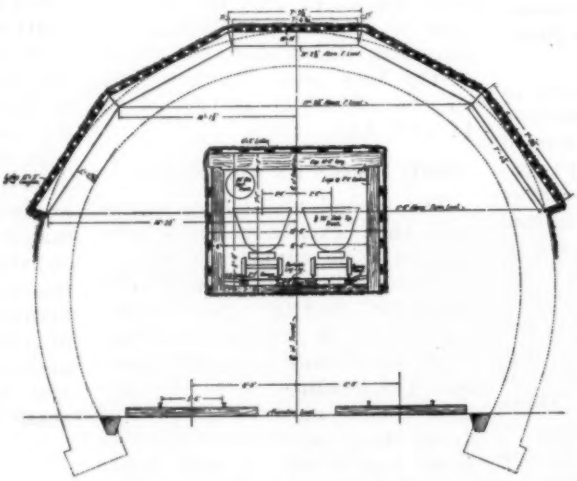
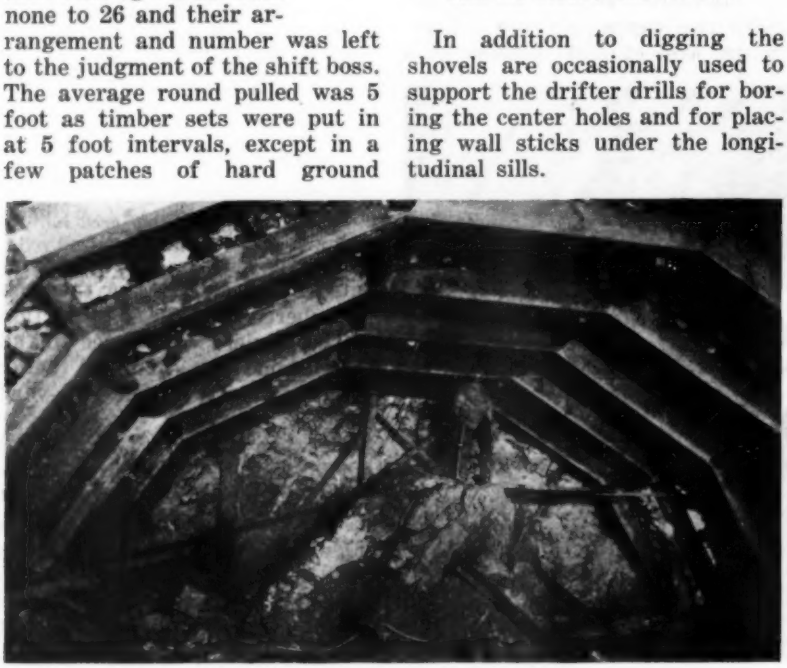


Diagram showing a section of the completed tunnel with the concrete lining indicated by the dotted lines and illustrating the plan of excavating and the timbering methods used in both the heading and the arch.

In addition to digging the shovels are occasionally used to support the drifter drills for boring the center holes and for placing wall sticks under the longitudinal sills.



This illustration of the heading shows the arch timbering.

Engineers Like Dependable Equipment

No attempt was made to produce records for driving. In the headings, a round (5 feet per shift) was aimed at and was sometimes exceeded although sometimes the progress fell far below this figure. The maximum weekly progress in the heading was 102 feet for 17 8-hour shifts and in the main excavation 75 feet for 75 shifts. The maximum weekly output for one of the Bucyrus-Erie shovels was approximately 1200 cubic yards which is considered very satisfactory by the Public Works Department under the very arduous conditions encountered. It has, of course, been impossible to give the shovels anywhere near steady digging owing to unavoidable delays for switching cars, blasting, timbering and the trimming done to accurate cross section with pneumatic picks. In addition they were up against hard digging at all times. However, they gave very reliable service with a minimum of mechanical trouble.

Hauling Methods from Shovels

The sketch at the top of the page shows the hauling method. Concreting, which was the faster operation was kept 2 to 3 chains back from the face leaving room for a rake of 5 to 6 trucks. Double tracks were maintained through the concrete profiling from the portal to the face, one track being used for in traffic and the other for out. Two crossovers about 5 or 6 chains apart were kept behind the concrete plant, as the work progressed the back one being taken up and laid ahead. The trucks used were 4

c. yd. side dump and the rakes were hauled to and from the portals by a 12-ton electric locomotive. A small 3½-ton battery locomotive was used for shunting and spotting the empty trucks to the shovel. The shovel lifted the leading empty car by means of a chain-and-beam sling, across from the left track to the right track, filled it and pushed it clear, to be picked up by the bigger locomotive. Concreting was carried on at the same time as the excavation and a certain amount of shunting had to be done between the concrete cars and the muck cars, but by timing the movements to suit, this was cut to a minimum and little delay was caused thereby.

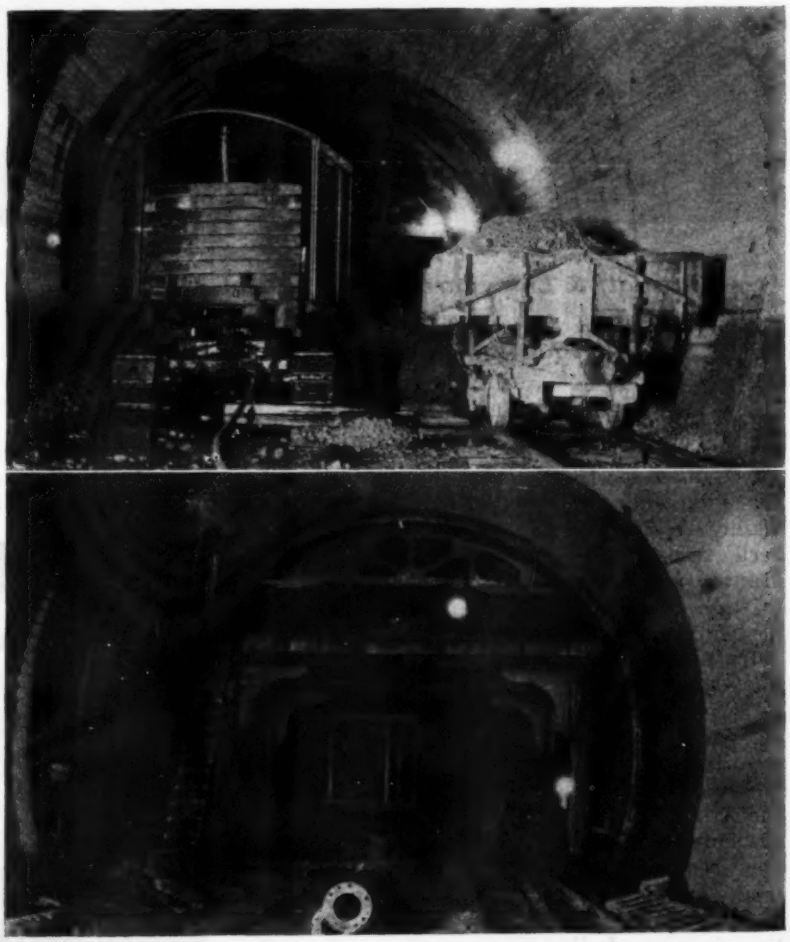
All the spoil from Nos. 1, 2 and 3 portals is used for the reclamation work between 1 mile 70 chains and 2 miles 37 chains, approximately 248,000 yards being required. The bottom lift spoil is hauled by lorries from No. 2 and 3 portals, and the top spoil is hauled direct from No. 1 portal, a sliding trestle being successfully employed. The trestle is shifted forward 40 feet each move, the whole of this distance being effective tipping room, for the back of the trestle is close boarded to act as a temporary retaining wall, and the pressure exerted by the filling greatly eases the work of moving forward; this is done by means of the winch on the crane placing the seawall stone. The bottom filling is carried forward on a grade parallel with the finished grade, but 20 feet below it, this being the height of the trestle. The spoil from No. 4 portal is stacked in a gully adjacent to the portal, and this will be a source of supply for road ballast for years to come.

The chief difficulty encountered has been in the variable nature of the ground. In the heading from No. 2 portal, the first five chains were found to be good standing ground, and drifter drills on columns were used, and 1½ to 2 pounds of gelignite per cubic yard necessary to break out the round. From that point to back to 2 miles, 61 chs., practically the whole of the excavation was done with pneumatic picks, so carefully had the ground to be handled. From the foot of the shaft, in both directions, several chains of rock, requiring no timbering, were passed through, then working toward No. 3 portal, a stretch of particularly broken and wet ground was passed through. At 5 miles 20 chains a stream of water was tapped, and it is estimated that 3½ million gallons of water was pumped out before the tunnelers could resume operation. At the start of the inrush, the rate of flow was in the proximity of 800 gallons per minute, and gushed out under pressure. So broken is the rock in the vicinity that within a few days surface springs, 400 feet above and several chains off the line of the tunnel showed signs of drying up. A short distance past this point, hard ground was again encountered. Before striking this broken ground, the tunnelers were using the heavy drilling machine, drilling 26 holes to a 10 foot x 8 foot face, and averaging four steels and 2 pounds of gelignite to every cubic yard. With the change of ground no explosives were used and light pneumatic picks did the excavation.

The same thing has been experienced at No. 3 portal. These changes of country, which make changes of method of working necessary, greatly hindered the progress, and it was found advisable to change from the centre heading to the bottom heading, from which the heavy ground, and as the headings advance this tends to be in the ascendent, can be more conveniently handled.

Compressed air is supplied from two stations, one situated

(Continued on Page 200)



Above: Transferring the spoil from the head excavation into dump cars with one of the ¾-yard tunnel shovels. Below: Steel profiling for concreting just ahead of completed section of the tunnel.

Maryland Improves Roads for Tercentennial Traffic

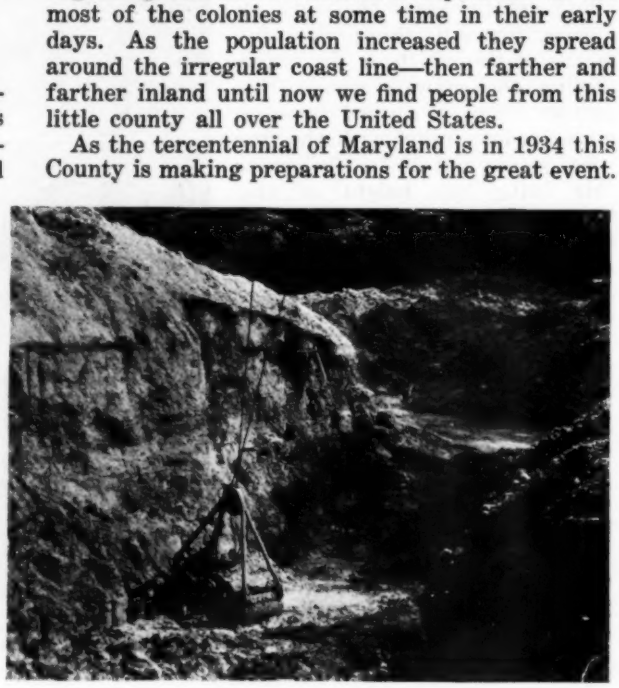
On another Christhilf & Ensey job . . . excavating a drainage channel from a highway culvert.

Christhilf & Ensey turn out perfect job of grading and paving on 5½ mile section north of Leonardtown.

ON THE EXTREME lower end of the Southern Peninsula of Maryland which extends between the Potomac River and the Chesapeake Bay lies St. Marys County. It was settled mainly by Jesuit Pilgrims under Cecilius Calvert, second Lord Baltimore, who had been granted a charter by King Charles the First, to form a colony named Maryland in honor of his Queen Henrietta Maria.

In 1633 he chartered two ships the "Ark" and the "Dove" and put his younger brother Leonard in active charge of the expedition while he remained in England, to take care of the political negotiations. They set sail from Cowes on the Isle of Wight on November 22nd, 1633, crossed the Atlantic and landed at St. Clement's Isle on the Potomac side of the Peninsula. This section appeared so bleak that they turned about and finally landed on March 25th, 1634, in the sheltered cover where St. Marys City now lies. Here they found an Indian Village and negotiated for its purchase with hatchets, colored clothes and other trinkets. This colony prospered from the beginning and never suffered a depression as did most of the colonies at some time in their early days. As the population increased they spread around the irregular coast line—then farther and farther inland until now we find people from this little county all over the United States.

As the tercentennial of Maryland is in 1934 this County is making preparations for the great event.



One of the first items to be taken care of was to see that the highways were in proper condition, to take care of the influx of forty thousand out-of-State automobiles which they expect in this county for the celebration.

The road for a distance of five and a half miles north of Leonardtown toward the Nation's Capital, which is fifty-six miles distant, had been gravelled with native material about 1910. It

Left: John Ensey. Right: Frank Christhilf.

was maintained with road machines and packed solidly by traffic throughout the years until 1926. At this time, it was treated with a heavy oil which penetrated to a depth of approximately two inches. This made a road comparable to a bituminous macadam but unsuited to centennial traffic, due to the high rounded crown to the center.

Old Gravel Utilized As Base

After the necessary preparatory work had been accomplished, the State Roads Commission of Maryland advertised for bids for the reconstruction of this section of road. It is the first highway project to come under NRA rules in the State of Maryland and is run on two five-hour shifts per day. There is approximately forty-thousand cubic yards of earth excavation in the job. When the engineering was done it was decided to add thirty-inch concrete shoulders on either side of the old road for a distance of one-and-a-half miles out of Leonardtown. The old oil-gravel surface between these shoulders is left for a base for a cold process bituminous wearing surface on which work is now under way under a separate contract.

The remaining four miles of the job is practically all relocation and will be a twenty-foot concrete road, eight-inches thick, with transverse joints each forty feet and a longitudinal joint in center.

Christhilf & Ensey Move Fast

When the bids were opened on the third of October, 1933 it was found that Christhilf & Ensey of Baltimore were low with a lump sum bid of $129,334. On the following day they were awarded the contract and the job of resident manager fell to Frank D. Christhilf. Mr. Ensey is finishing up their Central Avenue job out of Washington, D. C.

Bulldozing with a Caterpillar tractor.

St. Marys County contains many famous old landmarks. Above: Here are the Newton Church and Manor House built between 1650 and 1658. The brick for the manor house was shipped to America from England. The lumber for the elaborate panelling of the interior was all whipsawed by hand. Center: A close-up of the manor house. The manor itself was a grant of over 1000 acres of land from the King of England. Below: The ox cart is still a common means of transportation in this section. The driver does not use reins but guides the animals with his voice and a long whip. Horace Mattingly is shown here with a team of oxen.

Above—left to right: John Dellape, Foreman, R. Z. Younger, Assistant Inspector, Walter Henritze, Superintendent, Walter Harple, Master Mechanic, George Weber, Paver Operator, Norman Dunn, Foreman, John Ryan, Tractor Man. Left: Alfred Saunders, Oiler, W. C. Pannill, Operator. Right: F. X. Spaulding, Oiler, Joe Cartzendafner, Operator.

On October ninth, Walter Henritze located on the job as Superintendent and started the men at clearing and grubbing and putting in drainage pipe. Norman Dunn, Harry Lewes, John Dellape and John Dent are the foremen.

H. D. Williar, Jr. is the Chief Engineer of the State Roads Commission of Maryland and Joseph Chaney is the District Engineer in this section. W. A. Frazier is the inspector in charge on this job and his assistants are G. H. Fooks on concrete structures, R. Z. Younger and H. D. Peddicord on pavement; J. F. Raley on excavation and J. E. Garner on office and records. Jim Lee who is well known in St. Marys County is the State Representative for the NRA and is always on the job to see that all parties concerned get a square deal.

Shovel Doubles on Crane Service

The 32-B special Bucyrus-Erie shovel arrived by trailer from the Central Avenue job on which it had handled 13,000 cubic yards in nine days, bank measurement —fifty percent of it being a stiff brick clay—on October 26th, and started on the grading. W. C. Pannill has the morning shift with Alfred Saunders as his oiler, while Joe Cartzendafner takes the levers for the afternoon with F. X. Spaulding oiling.

After the shovel had completed about 15,000 yards of the excavation it was decided to put a crane boom on it to handle the aggregates for the concrete shoulders. As they had among their equipment a fifty-foot boom of a Marion Type 7 steamer, they fitted it to the Bucyrus-Erie machine. They made the change to this boom and a Hayward three-quarter yard clamshell bucket on November 25th.

The sand and gravel for this job is supplied by Smoot Sand & Gravel Company and is dredged from the Potomac River in the vicinity of Washington. It is loaded into scows holding approximately 175 cubic yards and towed down the river to the wharf at Leonardtown. At this place it is loaded direct from the scows to four-yard International dump trucks with a Byers half-yard crane. It is then hauled to a point about midway on the job where they have built two timber ramps — one for dumping sand and the other for gravel. The Bucyrus-Erie crane then handles it to a Blaw Knox Aggremeter bin. From here the four-batch International trucks haul it to the Smith 27-Paver.

A one-cubic-yard batch consists of six bags of High Early Strength cement, approximately

J. M. Dent, Supervisor of County Roads.

1225 lbs. of sand and 2100 lbs. of washed gravel subject to daily correction for moisture content. At the paver the trucks back into the skip and discharge the sand and gravel, and the cement which has been distributed previously in six-bag lots at proper

Smith paver pouring shoulders on the widening operations.

intervals is added. On the other end of the paver the conventional boom and bucket have been replaced by a chute which discharges directly to the forms. At just the proper moment George Weber, the operator, moves the machine ahead on its caterpillar-type mounting and spreads the batch over about sixteen lineal feet.

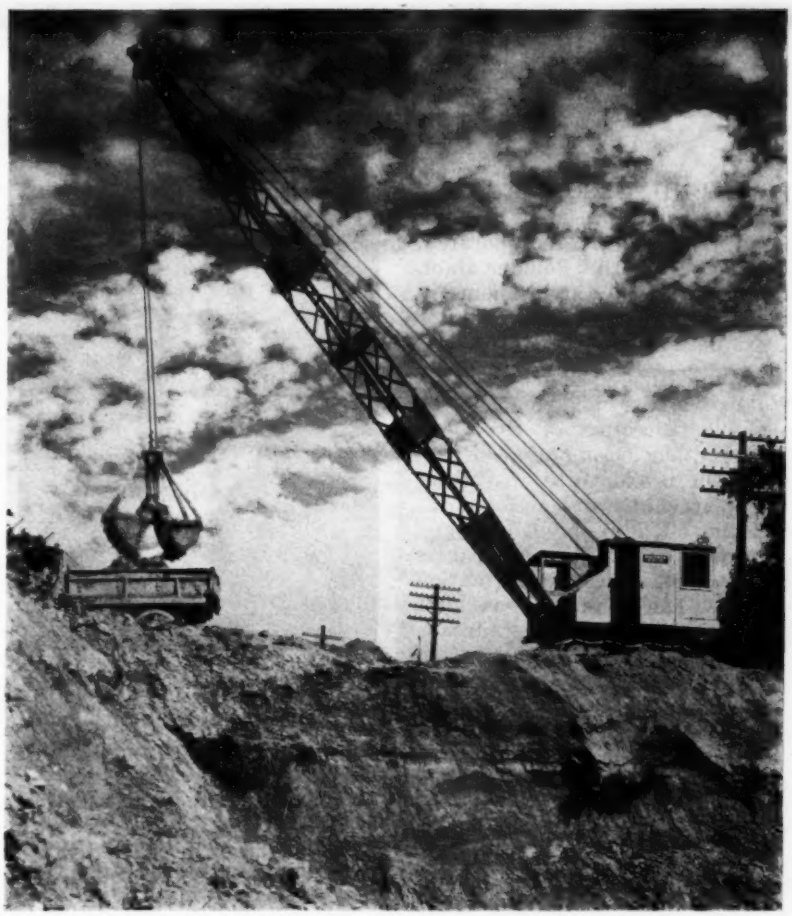
Operators cut accurate grades

By December ninth the two shoulders, each one-and-a-half miles in length, were completed and the crane was converted back to a shovel again and is starting on the remaining 25,000 cubic yards of excavation. As the remainder of the job is practically all relocation there will be some nice cuts in it and Mr. Henritze states that he is expecting some good yardage. On some of the curves on this job there is as much as thirty inches of super-elevation in the thirty-two foot roadway. So far, the operators have had no trouble in cutting these to grade without backfilling.

Handling concrete aggregates to the Blaw-Knox bin on the job north of Leonardtown.

Christhilf & Ensey formed a partnership in 1919 and have been specializing on highway and bridge construction since that time. Prior to this, Frank D. Christhilf was a partner in Christhilf & Carozza. This company split up during the war. John H. Ensey has been a civil engineer with an enviable reputation on railroad and tunnel work before he became associated with Mr. Christhilf. Among others, he was with the Norfolk and Western Railway for a number of years. Both Mr. Christhilf and Mr. Ensey are members of the American Society of Civil Engineers.

They expect to finish this job in record time and we believe it will be a perfect job judging by the two projects they completed in 1933 and many others in the past.



Accurate control spots the bucket squarely over the truck.

Snaps at San Gabriel No. 1

FROM West Slope Construction Company's operations at San Gabriel Dam No. 1, come these two snapshots showing excavating operations. The upper view shows one of their Bucyrus-Erie 120-B electric dragline excavating on the canyon floor and the lower view a beautiful job of dump grading.

PHOTOS COURTESY L. J. GRUNDER, RICHFIELD OIL CO.

EXCAVATING ENGINEER

A Monthly Publication Devoted to Excavating and Allied Subjects

REGULAR SUBSCRIPTION: $1.00 a year; Canada, $2.00 per year. SPECIAL SUBSCRIPTION: Upon application on card inserted in this number, Excavating Engineer will be sent frequently (not regularly) free of charge. Only for those engaged in the industry of excavation.

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The Business Situation

INDUSTRIAL production for February showed an advance of about 11 per cent over the month of November, which was the low of the first reaction following the "bottom" reached in March, 1933. Eleven per cent improvement in a three months period is an excellent advance. Stated another way, it is a recovery to 73 per cent of normal from 66 per cent of normal.

Business activity has also shown very decided improvement, although it appears to be registering some uncertainty at the moment—probably due to the possibility of labor troubles. Labor difficulty at the present time would check our advance and bend the curve down again. The recent trends of both stock prices and business activity are apparently discounting this possibility.

One of the best indicators of coming prosperity has always been activity in the construction industry. This is due largely to the fact that activity in the construction industry connotes a corresponding activity to come in other industries which supply things made necessary by new building. The exact value of this indicator at the present time is unknown because the stimulus in this industry is largely due to the expenditure of government funds rather than the expenditure of private funds. If private capital begins to flow into the same channels and sustains the volume that the governmental expenditures have started, the present activity does preface a period of prosperity.

Automobile production is another very interesting indicator, because normally it is an indicator of public sentiment and because many another industry depends upon it for business. At the present moment, for example, steel production is showing an increase sympathetic to the rise in automobile production. This is an important factor in recovery, but it is difficult to determine the exact weight to place upon it at the moment, because automobile production is somewhat ahead of the present rate of sales. Freight car loadings, which usually lag somewhat behind activity in the automobile building and steel industries, have shown some improvement, but not as much as we would like to see.

Exports, very important to a country that has surplus production facilities, have shown some improvement in the last months.

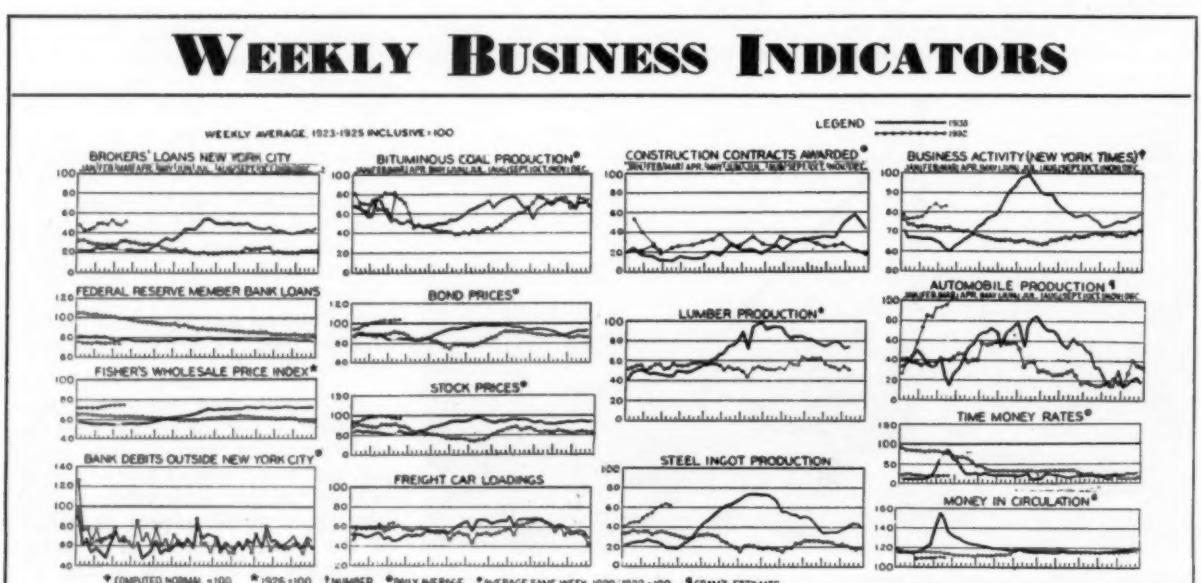
Activity in the textile industry is an important factor in the trend of total business activity, because of the very great volume of its output. The textile industry is one of our largest, but its value as an indicator is considerably reduced because the industry tends to have alternate good and poor years.

Coal production has given a satisfactory account of itself during the past several months, reflecting the severe weather in many parts of the country.

Taken all in all, the prospects for the coming six months seem to indicate increasing business activity with possible labor trouble as a serious cloud on the horizon.

The plan for the reduction of the cotton crop by bonus payments for reduced acreage appears to have failed. The cotton yield per acre has been higher than ever, with the result that the total crop was larger, despite considerable reduction in acres harvested. Furthermore, certain areas, notably in Texas, which have not previously been planted with cotton, are being cleared and prepared for the growing of

WEEKLY BUSINESS INDICATORS


WEEKLY AVERAGE, 1923-1925 INCLUSIVE = 100
LEGEND
BROKERS' LOANS NEW YORK CITY
BITUMINOUS COAL PRODUCTION*
CONSTRUCTION CONTRACTS AWARDED*
BUSINESS ACTIVITY (NEW YORK TIMES)†
FEDERAL RESERVE MEMBER BANK LOANS
BOND PRICES*
LUMBER PRODUCTION*
AUTOMOBILE PRODUCTION ¶
FISHER'S WHOLESALE PRICE INDEX*
STOCK PRICES*
TIME MONEY RATES*
BANK DEBITS OUTSIDE NEW YORK CITY*
FREIGHT CAR LOADINGS
STEEL INGOT PRODUCTION
MONEY IN CIRCULATION*
† COMPUTED NORMAL = 100 * 1926 = 100 † NUMBER * DAILY AVERAGE * AVERAGE SAME WEEK, 1930-1932 = 100 ¶ CRAM'S ESTIMATE

cotton next year. The Bankhead bill, although it gives the Secretary of Agriculture power to determine the amount of cotton which may be ginned each year—based on the output of each individual farmer in previous years, and although it would be the first large scale compulsory program of crop reduction, seems to have the quite general approval of cotton growers.

The immediate menace to the recovery now in progress is the failure of Congress to amend the Securities Act and the possibility of the enactment in their present form of the Exchange Control Bill, the Wagner Labor Disputes Bill and the extraordinary and apparently unconstitutional Bill for Unemployment Insurance known as the Wagner-Lewis Unemployment Reserve Act.

Contracts awarded for all classes of construction in the 37 states east of the Rockies during the initial half of March reached a total within 4 per cent of the volume reported during the entire month of February, according to figures of *F. W. Dodge Corporation*. Construction awards in the first 15 days of March, totaling $92,521,800 were larger, also by 55 per cent, than the total reported for the entire month of March, 1933. Although the increases over last year were due chiefly to larger governmental undertakings, the Dodge Bulletin indicates a moderate gain in privately-financed construction projects as well.

February awards for construction of all descriptions in the 37 eastern states totaled $96,716,300 as against $18,663,700 for January and $52,712,300 for February, 1933. February awards were 83 per cent larger than those registered in February, 1933. Gains over last year were shown for each of the four major classifications: residential building; non-residential building; public works; and public utilities. Likewise, increases were shown both as respects publicly-financed construction and privately-financed work. This latter item registered a gain also as contrasted with January of this year; but publicly-financed awards showed a recession of 59 per cent from January.

Contracts for construction of all types showed gains over February 1933, in each of the 13 Dodge districts, except the Metropolitan Area of New York, Upstate New York and Texas districts. For the initial two months of 1934 contracts were larger than in the corresponding period of 1933 in each of the 13 districts except Metropolitan New York, Upstate New York, New Orleans and Texas territories.

Contemplated construction reported in February totaled $436,417,500 as against $475,894,600 in January and only $114,185,900 in February, 1933. Gains over last year in newly-planned construction were shown in each of the four major classes of work. Increases likewise were well distributed geographically.

TWO bills are pending in Congress to provide more Federal road money: one, introduced by Senator Hayden, would provide $125,000,000 for each of the two fiscal years 1935 and 1936, to be matched in part by the states; the other, by Congressman Whittington, would provide an additional $400,000,000 grant under PWA, to be available after July 1st and until expended.

The Highway Program

THE American Road Builders Association has issued a little pamphlet that should be in the hands of every highway engineer, contractor and employee. It briefs clearly and comprehensively highway revenues and expenditures with a general outline of the highway situation and a proposal for a national long-time program of highway and street construction. Write the American Road Builders Association at National Press Building, Washington, D. C., for a copy. Read it, study it, show it to friends, talk about it. The highway industry will be better off with a definitely planned program . . . the country will benefit by increased safety, convenience and economy through a sane and logical program of highway development, improvement and maintenance. The ARBA booklet gives the facts . . . send for it.

Status PWA Highway Program

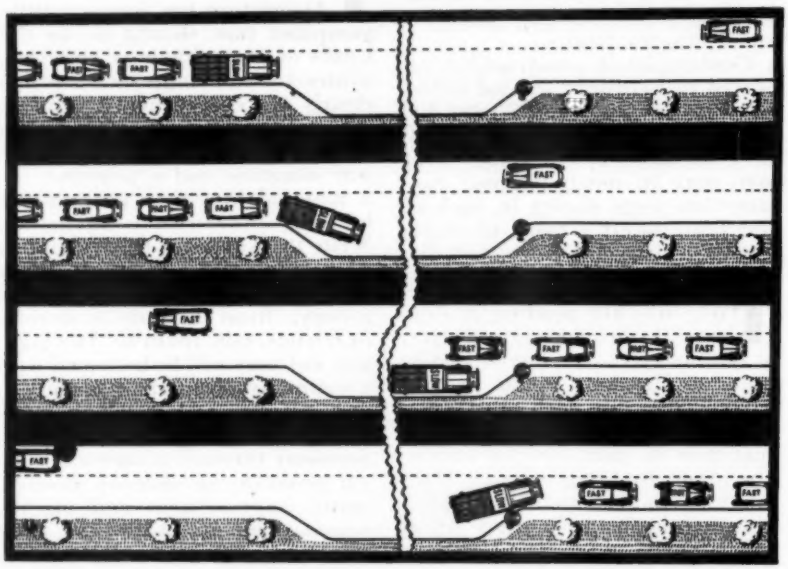
(As of March 10th)

State	Work Advertised for Contract (Including Force Account Work)				Work Under Construction			
	Number of Projects	P. W. A. Funds (Sec. 204)	Percentage of Allotment	Estimated Total Cost	Number of Projects	P. W. A. Funds (Sec. 204)	Estimated Total Cost	Number of Men Employed
Alabama	80	$ 4,114,000	49.2	$ 6,636,000	56	$ 3,328,000	$ 5,671,000	4,885
Arizona	50	4,020,000	77.1	4,567,000	33	3,359,000	3,865,000	1,370
Arkansas	107	3,643,000	54.0	4,239,000	59	2,086,000	2,615,000	2,404
California	124	12,441,000	79.7	15,928,000	90	9,982,000	12,601,000	5,555
Colorado	97	4,965,000	72.2	4,976,000	55	3,075,000	3,086,000	1,704
Connecticut	20	2,799,000	97.7	2,981,000	15	2,144,000	2,326,000	246
Delaware	22	1,314,000	72.2	1,314,000	13	1,054,000	1,054,000	938
Dist. of Col.	17	1,911,000	99.6	1,942,000	11	1,398,000	1,430,000	306
Florida	69	4,973,000	95.1	5,961,000	60	3,842,000	4,751,000	3,834
Georgia	113	4,647,000	46.1	4,647,000	78	3,287,000	3,287,000	3,693
Hawaii	12	1,578,000	84.3	1,892,000	9	1,198,000	1,430,000	421
Idaho	74	3,034,000	67.6	3,090,000	55	2,557,000	2,606,000	655
Illinois	217	12,060,000	68.6	12,060,000	122	6,735,000	6,735,000	3,642
Indiana	88	5,430,000	54.1	5,436,000	23	2,182,000	2,182,000	618
Iowa	167	7,846,000	78.0	8,253,000	82	5,284,000	5,601,000	447
Kansas	234	10,055,000	99.7	10,429,000	135	6,537,000	6,776,000	5,364
Kentucky	149	5,680,000	75.6	5,680,000	77	3,244,000	3,244,000	2,409
Louisiana	60	3,767,000	64.6	4,274,000	29	2,375,000	2,882,000	1,516
Maine	160	2,995,000	88.9	3,095,000	73	1,840,000	1,933,000	262
Maryland	43	1,443,000	40.5	1,481,000	22	1,031,000	1,045,000	494
Massachusetts	34	4,881,000	74.0	5,304,000	28	4,451,000	4,781,000	787
Michigan	195	10,859,000	85.3	10,910,000	113	6,465,000	6,467,000	1,860
Minnesota	242	7,155,000	67.1	7,249,000	121	4,272,000	4,352,000	1,849
Mississippi	95	3,486,000	50.0	5,528,000	64	2,520,000	4,020,000	3,355
Missouri	218	9,711,000	79.7	10,362,000	144	7,170,000	7,523,000	3,281
Montana	114	6,473,000	87.0	6,476,000	60	4,595,000	4,868,000	1,565
Nebraska	178	7,591,000	97.0	9,188,000	97	5,881,000	6,769,000	914
Nevada	32	3,538,000	77.8	3,568,000	18	2,457,000	2,457,000	970
New Hampshire	41	1,820,000	95.3	1,889,000	33	1,399,000	1,446,000	511
New Jersey	45	5,454,000	85.9	5,485,000	21	3,147,000	3,147,000	589
New Mexico	92	4,951,000	85.5	5,088,000	62	3,389,000	3,525,000	2,626
New York	237	20,668,000	92.6	23,087,000	189	17,409,000	19,103,000	2,475
North Carolina	189	5,383,000	56.5	6,344,000	79	2,938,000	3,243,000	3,568
North Dakota	150	3,132,000	54.0	3,360,000	40	924,000	924,000	108
Ohio	331	14,422,000	93.1	15,405,000	190	9,582,000	9,954,000	4,020
Oklahoma	152	7,172,000	77.8	7,172,000	69	4,104,000	4,104,000	3,469
Oregon	130	5,499,000	90.0	5,785,000	67	3,703,000	3,883,000	1,360
Pennsylvania	495	15,588,000	82.5	15,852,000	372	11,405,000	11,489,000	7,231
Rhode Island	26	1,585,000	79.3	1,585,000	15	1,197,000	1,197,000	183
South Carolina	89	3,784,000	69.3	3,787,000	76	3,466,000	3,469,000	3,284
South Dakota	104	3,146,000	52.3	3,309,000	38	1,317,000	1,350,000	564
Tennessee	104	5,880,000	69.2	6,456,000	58	3,506,000	4,023,000	3,694
Texas	475	18,110,000	74.7	21,345,000	300	12,569,000	14,519,000	15,964
Utah	93	3,659,000	87.2	3,665,000	53	2,007,000	2,011,000	770
Vermont	58	1,671,000	89.5	1,730,000	43	1,323,000	1,371,000	179
Virginia	196	7,029,000	94.8	7,345,000	106	4,147,000	4,436,000	4,045
Washington	103	5,477,000	89.6	5,495,000	64	4,665,000	4,683,000	1,375
West Virginia	91	3,841,000	85.8	3,872,000	49	2,228,000	2,252,000	790
Wisconsin	156	7,054,000	72.5	7,185,000	76	4,618,000	4,679,000	679
Wyoming	104	3,971,000	88.2	4,230,000	67	2,428,000	2,592,000	1,099
Totals	6,472	$301,705,000	76.6	$327,207,000	3,807	$205,820,000	$223,757,000	113,927

Force Account Work Included in Advertised. P.W.A. Funds—$22,548,000 Estimated Total Cost—$23,160,000
Number of Projects—909

FIELD NOTES

By-Passes to Relieve Congestion



AS A possible solution for relieving traffic congestion without prohibitive expense, A. W. Robertson of Pittsburgh proposes by-pass widening on two-lane highways at suitable intervals.

Mr. Robertson's plan, illustrated in the accompanying sketch, provides for a spur roadway every few miles along two-lane highways to enable slow moving vehicles to travel along the by-pass at the right of the main highway for a distance sufficient to permit fast traffic to pass.

According to Mr. Robertson such an arrangement would greatly increase travel capacity on a two-lane highway. Greater safety would be accomplished by eliminating the necessity of fast traffic passing slow traffic against traffic in the left-hand lane. Location would be selected for the by-pass widening where the right-of-way problem could be most easily and economically met. Traffic facilities of a four-lane roadway would be approximated with only a fraction of the cost. By use of this plan a heavy traffic highway could be built by adding year by year additional by-passes to take care of increasing traffic and thus distributing the cost of a four-lane highway over a period of years.

It pays to read instruction books

A CONTRACTOR experienced difficulty with the unloader valve on his GA-2 machine. The operator on the machine, instead of following instructions, took the valve to a machine shop and had the valve pistons buffed so that they would not stick. This, of course, ruined the valve as the pistons are a lapped fit, and are fitted at the factory. It was necessary for the customer to purchase a new valve at a cost which could have been saved as what the valve needed was simply cleaning and lubrication.

Prevents Stealing or Taking of Grease Cups

SMALL GREASE CUPS left on temporarily unused and isolated machinery are often stolen or contrarily taken in an emergency with the best of intentions of later replacing them. A grease cup for the sake of the parts below it should be left in place and tight in the threads. The casual or well-intentioned borrower as a rule comes equipped on his errand with only a light wrench, sufficient to remove the cup. Take a piece of fairly heavy wire and coil it tightly around the lower or wrench hex part of the cup, tapering the ends and closing them snugly up to the cup. The wire, however, will loosen and turn a bit. A wrench of any kind or a pair of heavy pliers cannot be used to remove it. More tools than a wrench are needed to pull off the wire, and the trouble to get them will generally send the borrower elsewhere or after a new cup.–*Frank W. Bentley, Jr.*

Cane Mat Foundations for Roads

A TOWNSHIP in western Netherlands, which lies below sea level and where the soil is unstable mud of unknown depth, has had difficulty in getting permanent road beds to carry heavy traffic in the bulb districts. A trial section has been built using reed mats after their successful use in a railroad grade The canes, or reeds are very resistant to rot, having been used for roofs some of which have been in service for 250 years.

The reeds are impregnated with creosote, then woven into mats two inches thick. Drain tile are laid in the soil, a two-inch layer of sand is placed on the subgrade, then the mats are placed and the surface is completed with brick filled with asphalt. The section of road will be opened in October and as there is heavy truck traffic, it is expected that the suitability of this type of road will be determined at an early date.

Watch out for leaking gasoline

A RECENT SHOVEL accident resulted in considerable damage from fire and a day and a half delay on the job. The machine in question had been running with a leaky carburetor and nothing had been done to correct the trouble. The accident happened when the operator left the machine while the motor was idling and left a lantern on the rear deck so that the gasoline from the carburetor dropped down on to it and started the fire. Leaks anywhere in the gas line are expensive because they waste gasoline but the fire hazard they create is an even greater reason for repairing them immediately.

EQUIPMENT
You Ought to Know About

Three-eighths Yard Full Revolving Convertible Shovel

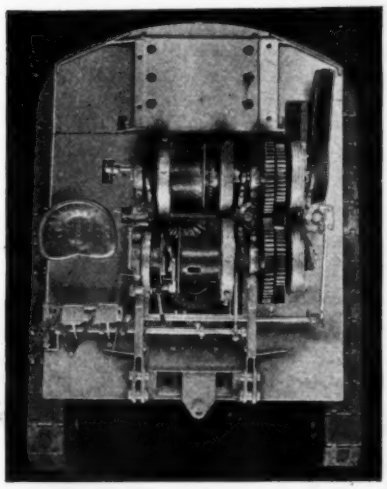
THE NEW 10-B, ⅜-yard excavator, just announced by Bucyrus-Erie Company is an astonishing little machine. Fully and quickly convertible, it is offered with all types of front end equipment as a shovel, dragline, crane, clamshell, drag shovel, skimmer scoop, back filler, or pile driver.

Full-revolving, the 10-B offers practical working ranges that compare favorably with larger machines. The shovel with standard boom at 45° angle has a maximum cutting radius of 20′3″, a clear dumping height of 12′6″. The crane rating at 10′ radius is quoted at 7,000 pounds. Dragline and clamshell easily handle a ⅜-yard bucket on a 28-foot boom.

The machine weighs only 7½ to 8 tons depending on the equipment used . . . an important feature for those who must move their machines over highways. This light weight and the compactness of the machine has been secured by utilizing high quality, heat-treated, modern alloy steels with welded construction and simplified design, so that all the strength and dependability of a much heavier machine is secured.

Users of ⅜-yard machines have needed more mobility than has been available in any full-revolving machine of this size. The 10-B meets this need with something new in mobility. Speeds to 4¼ miles per hour are available. It steers accurately through friction clutches as readily as a tractor, making long, short or right-angle turns. It easily climbs grades even steeper than 30 per cent.

This new, full-revolving, ⅜-yard machine is remarkably compact, having a tail swing of only 5′7″. This makes it particularly suited for work in close quarters frequently encountered with a machine of this size. Among the many mechanical features that make the performance of the



10-B possible, are automatic lubrication; ball and roller bearings throughout; elimination of center pintle by the hooked-roller swing-circle which has proved so successful on Bucyrus-Erie's 16-B and large railway cranes; a new type of boom construction: a revolutionary new dipper; and power dipper trip.

For full detailed description of the 10-B, write *Bucyrus-Erie Company, South Milwaukee, Wisconsin,* mentioning this publication.

Sinker Drill

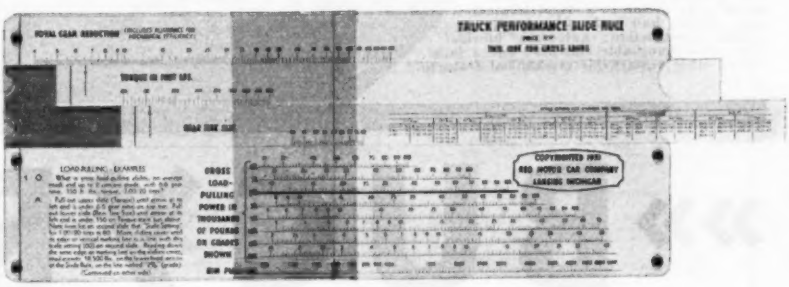
A NEW heavy sinker drill particularly recommended for hard ground, long hole quarry drilling, etc., has recently been announced by *Chicago Pneumatic Tool Company, 6 East 44th Street, New York.* The manufacturer claims this new sinker drill is easier to handle and faster than other drills of this weight and type. The valve is positive in action and gives powerful rotation. It is equipped with an exhaust choke for emergency blowing for cleaning the hole of drill cuttings. The diameter of cylinder is three inches; overall length with retainer 24¾ inches; net weight 80 pounds. Complete specifications may be obtained by writing the manufacturer at the above address. Please mention *Excavating Engineer.*

Slide Rule Aids When Selecting Motor Truck

SELECTING the correct equipment for the job has long been a problem, not alone in the industry of excavation. Here, however, stresses out of the ordinary are the rule rather than the exception. As an aid to reaching the correct answer in the choice of motor truck hauling equipment, Reo Motor Car Company engineers have designed and improved a performance slide rule, reproduced below.

The rule indicates instantly the safe, economical load pulling capacity, hill or grade climbing ability in the different gears, and safe maximum road speed for any motor truck or tractor-tailer combination for which engine and power unit chassis specifications are known. Engine power or torque, axle and transmission

(Continued on Page 201)



NEW *full revolving*

WEIGHS 7½ TO 8 TONS - SPEEDS TO 4¼ MILES PER HOUR - 35 TO 52 HORSEPOWER - STEERS LIKE A TRACTOR THROUGH FRICTION CLUTCHES AUTOMATIC LUBRICATION

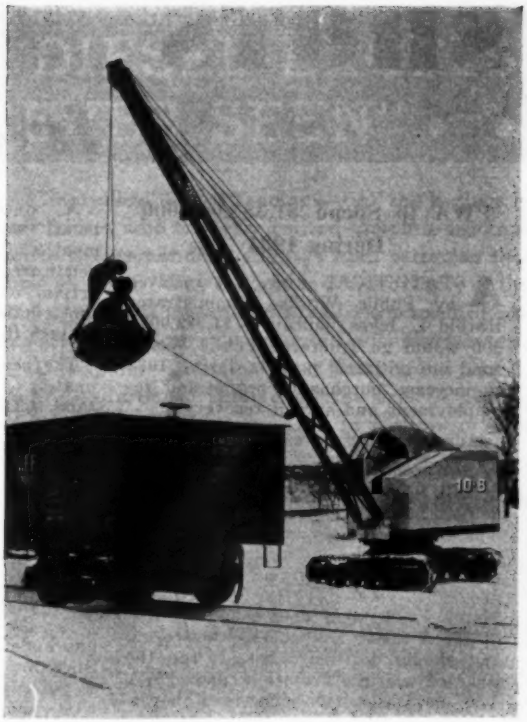
The finest of modern materials and construction go into the balanced value of the 10-B. Heat treated, alloy steels; ball and roller bearings; welded construction; automatic lubrication; interchangeable clutches; and a long list of other remarkable mechanical features.

»» BUCYRUS-

When writing to Bucyrus-Erie Company, please use coupon or card bound in this issue.

3/8-yard

SHOVEL . . . DRAGLINE . . . CLAMSHELL . . . . SKIMMER . . . LIFTING CRANE DRAGSHOVEL . . . BACKFILLER . . . PILEDRIVER



» » HERE'S a startling answer to today's problem of increased output at lower operating cost. Light in weight, simple in construction, small in size, economical in price, the 10-B brings something new in mobility, power, strength, speed and dependability to the user of small excavators.

Full-revolving, the 10-B offers operating efficiency and working ranges that bring real excavating jobs into the range of this new 3/8-yard machine. The digging motions are very fast and the several parts of the cycle are beautifully balanced for smooth operation and big output. The controls are extremely responsive and it is easy for the operator to hold accurate grades.

You've never seen an excavator with the mobility of the 10-B — long, short or right-angle turns are negotiated with ease. It moves readily up grades even steeper than 30 per cent.

For three years Bucyrus-Erie has been working to perfect this remarkable new machine — designing and redesigning, testing and proving. Now the 10-B, with all its unique money-making features, is ready to go on your job, with the assurance of the world's largest builder of excavating equipment that it will give you dependable service and outstanding performance.

Get the new 10-B bulletin — find out about this dynamic little excavator that delivers a new kind of 3/8-yard performance. Sign and send the coupon now.

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BUCYRUS-ERIE COMPANY
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Gentlemen: Please send the 10-B bulletin.

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Company_____

Address_____

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☐ For file only. ☐ Might need a 3/8-yard soon.

When writing to Bucyrus-Erie Company, please use coupon or card bound in this issue.

SHOTS from the Firing Line

PWA to Spend $1,382,000,000 During 1934

A STATISTICAL study was received by Public Works Administrator Harold L. Ickes indicating $1,382,000,000 would go from the Public Works fund into citizens' pockets during 1934 to increase purchasing power and re-employment and spread recovery.

Administrator Ickes said:

"No promises of any kind have been or will be made by PWA in advance of delivery, but it is my desire to show what PWA seeks to accomplish and give some indication of what may be expected in this phase of the recovery program. There has been a lot of unjustified talk from sources independent of PWA about how much PWA could and should do. All statistics run the risk of misinterpretation and PWA does not desire to raise false hopes.

"While Public Works can take over some of the persons employed by Civil Works it will never take over all of them at one time. Also Public Works will give employment to many other persons who never worked on Civil Works jobs and result in wider indirect and industrial employment of benefit to capital goods industries."

It was explained that the figure of $1,382,000,000 of PWA expenditure in 1934 was the best result of statistical compilations taking into consideration various base marks and factors affecting the program, for which no exact criterion exists.

Excluded from this figure are the Statutory and Executive allotments from the $3,300,000,000 PWA fund. Such Statutory and Executive allotments total $1,101,000,000 or approximately one-third of the entire amount. In such Statutory and Executive allotments are included such items as $400,000,000 for the Civil Works Administration (all spent); $323,000,000 for the Civilian Conservation Corps (partly spent); $100,000,000 for the Farm Credit Administration; $100,000,000 for the Public Works Emergency Housing Corporation; $50,000,000 for the Tennessee Valley Authority; $25,000,000 for the Subsistence Homestead Bureau; $25,000,000 for the Surplus Relief Corporation to retire submarginal lands from production and other items.

From the balance of approximately a little over $2,000,000,000 from which the 1934 figure was drawn the PWA made allotments for Federal and non-Federal projects, including many for loans and grants to municipalities and local governments, housing and railroads.

A steadily mounting figure per month was shown through the early months of 1934 with the velocity of expenditures increasing rapidly with the arrival of spring and summer—good construction months when it is feasible to push the Public Works building.

The peak was calculated at approximately $165,000,000 per month for June, with both May and July the next two best months for major expenditures. The flow of funds will dwindle through the fall to a minimum of less than $100,000,000 per month by the end of the year when construction is slowed by weather conditions so that it may not be pushed economically.

The report compiled at the Administrator's direction indicated that some half a billion dollars of the Federal and non-Federal allotments (exclusive of Statutory and Executive allotments) would remain to be expended in 1935, while some one hundred million would remain for expenditure in 1936. PWA expenditures from the original fund in 1935 and 1936 are comprised chiefly of large scale construction which cannot be economically completed in a lesser period. Included in these later expenditures are completion of the PWA naval construction program, giant dams and reclamation projects, flood control and navigation improvements such as are under way in the Mississippi River Valley and certain major non-Federal public works including great metropolitan sewage disposal programs.

H. W. Morrison Elected President of Six Companies, Inc.

HARRY W. MORRISON of Boise, Idaho, has been elected President of Six Companies, Inc., to succeed the late E. O. Wattis. Mr. Morrison, who started in the construction field as a timekeeper some 30 years ago, is a comparatively young man, being 49 years of age. He has made an excellent reputation with his member firm of Six Companies, Morrison-Kundsen Company which was organized in 1912.

General Contractors Appoint Code Authority

THE DIVISIONAL CODE AUTHORITY is composed of 17 members, 12 of whom shall be appointed annually by the Executive Committee of the Associated General Contractors of America, from its Board of Governors or its Advisory Board. Each appointed member serves until a successor is named. The twelve appoint to the Divisional Code Authority five additional persons engaged in general contracting. These five, at the time of their selection, are not to be representative of or responsible to members of the Association. They, too, serve until their successors are appointed.

The 12 names submitted by the Executive Committee of the Associated General Contractors of America, Inc., and approved by General Johnson are: W. F. Austin, W. E. Wood Co., Detroit, Mich.; E. T. Foley, Foley Brothers, Inc., Pasadena, Calif.; E. P. Forrestel, Cold Spring Construction Co., Akron, N. Y.; N. F. Helmers, Siems-Helmers, Inc., St. Paul, Minn.; A. E. Horst, Henry W. Horst Co., Philadelphia, Pa.; W. A. Klinger, W. A. Klinger, Inc., Sioux City, Iowa; R. E. O'Connor, J. C. O'Connor & Sons, Inc., Ft. Wayne, Ind.; E. P. Palmer, Senior & Palmer, New York City; L. E. Ray, Diamond Engineering Co., Grand Island, Neb.; F. L. Shackleford, Potter & Shackleford, Inc., Greenville, S. C.; A. C. Tozzer, Turner Construction Co., New York City; H. B. Zachry, Zachry Co., Laredo, Tex.

The five persons appointed by the above twelve to the Contractors' Code Authority and approved by General Johnson are: W. C. Miller, W. C. & A. M. Miller, Washington, D. C.; E. M. Rust, Rust Engineering Co., Pittsburgh, Pa.; C. H. Simpson, Municipal Paving and Construction Co., Nashville, Tenn.; R. A. Whidden, Whidden Construction Co., Boston, Mass.; J. B. Bray, W. W. Boxley & Co., Roanoke, Va.

Progress on Public Works Highways to March 10, 1934

PROGRESS made on emergency construction of public works highways to March 10 under the supervision of the U. S. Bureau of Public Roads shows a total of 6,472 projects, estimated to cost $327,207,000, had been advertised for contract, begun by day labor employed directly by the highway authorities, or completed. The cost of the day labor projects included in the above is estimated at $23,160,000.

Of the 5,757 projects awarded for construction, 3,807 were under construction on March 10, and 738 were completed. The work under construction, which is estimated to cost $223,757,000, was giving regular employment to 113,927 men.

In the whole country, work advertised for contract or started by day labor employed directly by the highway authorities involved 76.6 per cent of the $400,000,000 provided for public works highways under Section 204 of the National Industrial Recovery Act.

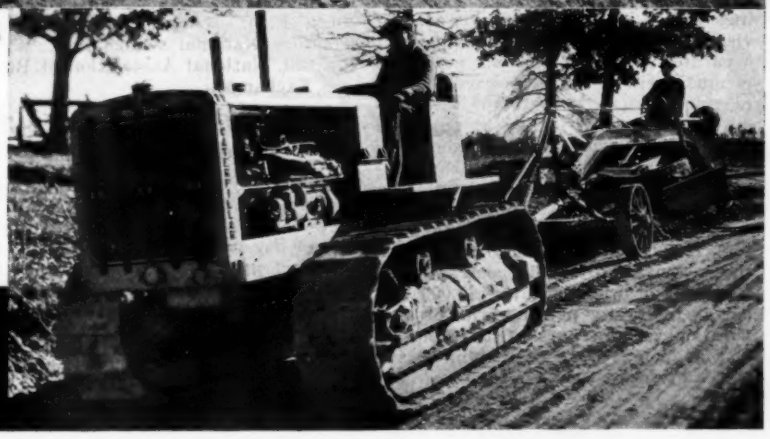
"THE 'CATERPILLAR' DIESEL EXCELS ANYTHING I HAVE EVER SEEN" • •

• SAYS THE COMMISSIONER OF HIGHWAYS OF AN ILLINOIS TOWNSHIP THAT HAD PREVIOUSLY OWNED THREE GASOLINE TRACTORS

The best judges of the "Caterpillar" Diesel Tractor — and the highest in its praise — are the purchasers who formerly owned gasoline tractors. They know by experience the tremendous savings from a tractor that burns low-price fuel, and less of it. They recognize the simplicity of the "Caterpillar" Diesel, and appreciate the advantage of a tractor that can be operated by the same men who formerly operated gasoline tractors. They have found in the "Caterpillar" Diesel a tractor that has big power, exceptional lugging ability, endurance. There are three sizes of "Caterpillar" Diesel Tractors — and engines available in stationary and portable power units. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

This "Caterpillar" Diesel Fifty Tractor, equipped with bulldozer, is cutting the costs of filling in around culverts on a Long Island, New York, road-building job.

AMERICA GOES DIESEL



Polk County, Georgia, found how to build and maintain more miles of road for fewer taxpayers' dollars—with a "Caterpillar" Diesel Tractor and "Caterpillar" Grader.

For your convenience in writing to Caterpillar Tractor Co., you will find a card bound in this issue.

Shots From the Firing Line— *Continued*

Federal Revenue from Motor Vehicles

THE 1934 Federal Revenue Bill, upon which hearings are now being held in the Senate, contains items anticipated from highway transportation sources as follows:

Lubricating Oils	$ 22,900,000
Gasoline	145,000,000
Tires and Inner Tubes	25,500,000
Automobile Trucks	3,200,000
Other Automobiles and Motorcycles	24,300,000
Parts or Accessories for Automobiles	4,200,000
	$225,100,000

These same items in 1933 brought a total of $165,637,351 to the Federal Treasury. For the year 1935 the anticipated receipts are $294,800,000.

Construction Code Goes Into Operation

AFTER SEVEN MONTHS of strenuous effort the Master Code of Fair Competition of the Construction Industry became effective March 2nd, thirty days after its signing by President Roosevelt. It is conceded to be the most comprehensive code written under the NRA and the most important single code formulated. To this Master Code designated as Chapter One will be appended thirty to forty additional chapters, each governing specialized divisions of the industry and setting forth the special rules agreed upon for regulating each of these under the general rules provided by the Master Code. The first of these sub-codes known as Chapter Two and governing the General Contractors was approved by the President, February 13th and goes into effect March 19th.

Chapter No. 1 provides for a Code Authority consisting of one representative for each of the sponsors of this Code, and in addition thereto the Administrator will appoint three non-voting members as his representatives, who will be entitled to sit in all meetings of the Code Authority. Each division of the industry shall have a separate Authority. In all cases its members will be representatives of employing groups. Members of the General Code Authority may at any time meet with Divisional Code Authorities. The Code Authority, with the Divisional Groups, will make investigations and surveys of the working of the code, and of the status of the construction industry. Provision is made for the registration of all contracts for construction work of over $2,000 undertaken by any person, firm, or corporation in any part of the country and financing the code administrative offices by fees based on amount of contracts.

Under the General Code there is provided a Planning and Adjustment Board, consisting of ten representatives of employers and ten representatives of labor, with an impartial chairman selected by and upon the recommendation of the Administrator. The duties of this particular Planning Board will be to handle and study the entire question of labor-employer relationship, and the planning and development of policies that embrace the broad spirit of cooperation and good will in the furtherance of matters of mutual interest to the employers and employees. This Board has been conceded the right to settle trade jurisdictional disputes when submitted to it by all trade involved in controversy.

The Code Authority will elect members of the Construction Board of Appeals, which will consist of one architect, one engineer, three general contractors and four specialized contractors. This important Board will determine conflicts between Chapters of the Code, etc.

The personnel of the Code Authority to administer the master construction code includes the following: S. F. Voorhees, Construction League of the United States; Wm. Stanley Parker, American Institute of Architects; Colonel John P. Hogan, American Society of Engineers; Messrs. A. C. Tozzer, R. E. O'Connor, N. F. Helmers and A. E. Horst, Associated General Contractors of America; E. M. Craig, American Construction Council; Oscar W. Rosenthal, National Association of Building Trade Employers; John P. Marshall, International Society of Master Painters; Robert D. Williams, Heating, Piping and Air Conditioning Contractors National Association; Arthur J. White, Cement Gun Contractors; J. D. Sargent, National Building Granite Quarries Association; Oscar A. Reum, Contracting Plasterers International Association; H. R. Cole, Tile and Mantel Contractors Association of America; R. J. Barrett, National Association of Master Plumbers; John McArdle, National Elevator Manufacturing Industry; D. P. Butcher, Mason Contractors Association of the United States and Canada; L. E. Guyot, American Road Builders Association; Frank L. Adams, National Association of Metal Furring and Lathing Contractors; F. P. Byington, Asbestos Contractors National Association; W. P. Carroll, National Association of Builders Exchanges.

Register Highway Contracts Beginning March 19th

ON AND AFTER March 19th highway contractors must register all new contracts entered into and pay a fee of one-tenth of one per cent of the contract price. This is required by the terms of the General Contractors Code (Chapter II of the Construction Industry Code) which is binding upon highway contractors.

Later Chapter II-C, which is now being formulated, will set up an administrative committee and rules and regulations to segregate highway contractors from other general contractors.

The separate Chapter (II-C) for highway contractors will not have anything to do with the registration of contracts and the collection of fees, this being covered by the general code.

10 Years Safety Record in Transportation of Explosives

THE ANNUAL REPORT of the Bureau of Safe Transportation of Explosives and Other Dangerous Articles, just published, shows that for the tenth consecutive year the railroads of the United States and Canada have carried dynamite and black powder without a person being killed or injured. In normal times the amount of these explosives carried reached an aggregate of more than 400,000,000 pounds. This is regarded as the most important safety record ever made in the transportation of dynamite and blasting powder. The record has been made possible by an intensive campaign of education among railroad employes and by constant supervision and enforcement of rules by the officials of the Bureau.

Heroes Recognized by Joseph A. Holmes Safety Association

HEROES of the mineral industries, who, by the exercise of courage and resourcefulness in times of stress and peril, saved the lives of fellow workers, were recognized by the bestowal of medals by the Joseph A. Holmes Safety Association at its annual meeting held in Washington, D. C. Awards of twelve medals were made to individuals for meritorious effort in the rescue of other workers. Sixty certificates of honor, in recognition of operation over long periods of time without fatalities or lost-time accidents, or with remarkably low accident records, or excellent progress in safety achievement, were given to coal mining, metal mining, and mineral-industrial plants; ten certificates were given to individual workers who had established excellent long-time safety records in working in mines, generally for having worked 50 or more years in mines without having sustained any accident which prevented the man from returning to his usual work the next day.

To John McGilvra of Grass Valley, California, a gold medal was awarded for his display of quick thinking, quick acting, and fearlessness in saving the life of Albert F. Seidman, in the North Star mine of the Empire-Star Mines Company, Limited, at Grass Valley, on March 14, 1933. When Mr. Seidman had been knocked unconscious by a shower of rock from a blast, Mr. McGilvra went to his rescue, exposing himself to the bombardment of fragments of rock and debris from a succession of blasts from about 30 nearby holes.

Gold medals were given to Benjamine F. Major and David H. Jones, of

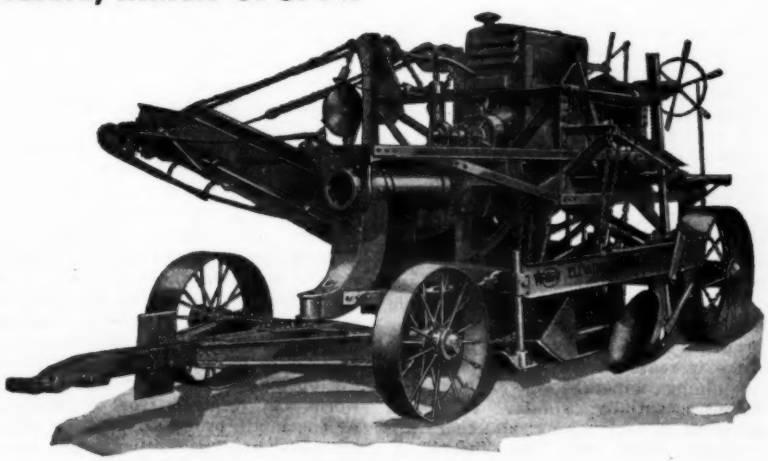
Western No. 6 Elevating Grader tearing up hard flint gravel solidified by the traffic of ten years, on Hoeffkin Bros. road job between California and Sedalia, Mo. At times, 10-inch boulders passed over the belt.

In Tough Digging Use The Western No. 6

WHEN A NEW concrete slab is to be laid on an existing gravel road, the Western No. 6 is the machine to dig out the channel. The stiff-leg control by which the big disc is forced and held in the ground enables the No. 6 to tear out the toughest gravel road bed. The plow of the No. 6 easily will enter ground so hard that it cannot be entered by a loose hung plow. This one feature of the Western No. 6 makes it possible to handle a wide range of jobs which cannot be handled by other types of elevating graders.

For complete mechanical details write for Catalog 31-CV.

WESTERN WHEELED SCRAPER COMPANY
Aurora, Illinois U. S. A.



The Western No. 6 Elevating Grader. Notice the tubular frame, stiff-leg plow control, three-point suspension, automatic belt tightener, motor driven belt and one-piece elevator.

WESTERN

For your convenience in writing to Western Wheeled Scraper Company, you will find a card bound in this issue.

Shots From the Firing Line—
Continued

Clarkdale, Arizona, in recognition of their courage and resourcefulness on May 4, 1933, in the rescue of John Stout, who was pinned beneath a boulder in the United Verde Copper Company's open-pit stripping operations and faced almost certain death from exposure to a round of shots that had begun to go off. At great risk to themselves, Messrs. Major and Jones pulled the burning fuses from the holes nearest to the imprisoned man, who was released after the blasting was completed. All three men miraculously escaped injury from the explosion of 12 to 15 shots that went off all around them.

Certificates of honor were given to 35 coal mines and mining companies, to 14 metal or non-metallic mineral mines or mining companies, and to 11 miscellaneous mineral industry plants, for some type of safety achievement.

"In the past year," said Scott Turner of the U. S. Bureau of Mines and President of the Association, "there has been an increase of safety in the operation of our mines and quarries, and in plants connected with the mineral industries, especially in coal mining. In the calendar year 1933, only one major mine disaster occurred, and that one resulted in but 7 fatalities; this compares favorably with the average of 17 major coal-mine disasters which occurred annually during the 5-year period 1906-1910 inclusive, just preceding the organization of the United States Bureau of Mines.

"Tentative figures indicate that there were but 1013 fatalities in the coal mines of the United States in 1933; this compares favorably with the 2658 average annual fatalities in the 5-year period 1906-1910 inclusive.

"The year 1933 was remarkable, not only for its relative freedom from major disasters, and its comparatively small number of fatalities in the coal mines of the United States, but also for the fact that our fatality-rate per million tons of coal produced, tentatively set at 2.83, is by far the lowest for at least 60 years. It is believed that, when the final figures are available, the rate will prove to be lower than 2.83. Another cause for congratulation is that both bituminous and anthracite mining established new lows in fatality-rate per million tons of coal produced in 1933.

"Definite data are not yet available as to accident-occurrence in other branches of the mineral industries, but there is reason to believe that results in mining minerals other than coal were essentially similar to those achieved in coal mining, and there are evidences that both the Joseph A. Holmes Safety Association and the Holmes Safety Association contributed materially to the safety progress made by the mining and allied industries in 1933."

New York Notes

The Arundel Corporation turned in the low bid of $119,253 on March 14th for dredging and rock removal in the East River in Diamond Reef Channel at the foot of Fulton Street, Brooklyn.

Pennsylvania Notes

Caterpillar Diesel Seventy-fives, Euclid wagons and this Bucyrus-Erie 100-B electric shovel team up to give big stripping yardage on the operations of the **Plymouth Excavating Company** near Girardville, Pennsylvania.

The United States Engineer's Office of Pittsburgh will invite bids for constructing the **upper guard wall extension and spur dike** at New Lork No. 4 on the Monongahela River at Rostraver. The bids are to be opened about April 5.

South Carolina

Specifications are being prepared for the removal of **3,750,000 cubic yards of earthwork** along the Intercoastal Waterway at Myrtle Beach, S. C., according to Col. W. Goff Caples, U. S. District Engineer at Charleston, S. C., who also says that the work is suitable either for draglines or hydraulic dredges.

Ohio Notes

O. W. Merrell recently received **approval from the U. S. Bureau of Public Roads** on highway projects in six counties amounting to approximately one-half million dollars. Six and one-third miles is involved and tentatively set for letting March 23.

Distributions of money received from the **sale of license tags during 1933** to counties and municipalities in Ohio amounted to $13,367,027, statistics of the motor vehicles bureau given out by registrar Glen M. Daily show.

By HENRY F. UNGER

After four months of delay, the **Hunkin-Conkey Construction Company** started work on the $1,015,000 Cuyahoga Heights unit of the new easterly sewage disposal project, building sludge digestion tanks with a gang of 75 men to be later increased. But on the opening of the first day of work, word was received from Washington to check all progress, because of inadequate finances until further investigation was carried on.

The Curry-Whitaker Construction Company is busy excavating ditches for the laying of several miles of water mains on Mayfield Road from Belvoy Road to Morningtone Lane, in Cleveland Heights.

The Painton-Martin Construction Company is encountering difficulties in their excavating in connection with the building of a retaining wall on the Chagrin River in Chagrin Falls.

The Cleveland Builders Company is using a Browning steam shovel for digging trenches for the laying of pipes in connection with the installing of the Carling Ale Brewery on the old Peerless Auto site on Quincey Avenue in Cleveland.

A contract with the **Great Lakes Dredge & Dock Company** of Cleveland to dredge the lower half of the Lake St. Clair channel at Detroit has been approved by Washington. The contract calls for an expenditure of $615,350.

The H. E. Culbertson Company of Cleveland won a War Department contract of $378,345 for levee work near New Orleans. The company submitted the lowest qualifying bid at Washington.

GEORGE W. McILRATH

George W. McIlrath, 50, former paymaster and supervisor for the Reaugh Construction Company, died at his home, 14409 Esmeralda Avenue. His family was the third to settle in East Cleveland. He was with the Reaugh Company 25 years. Surviving are his widow, Mrs. Rose McIlrath; a son, Samuel; his mother, Mrs. Mary McIlrath, and a sister, Mrs. F. W. Carroll.

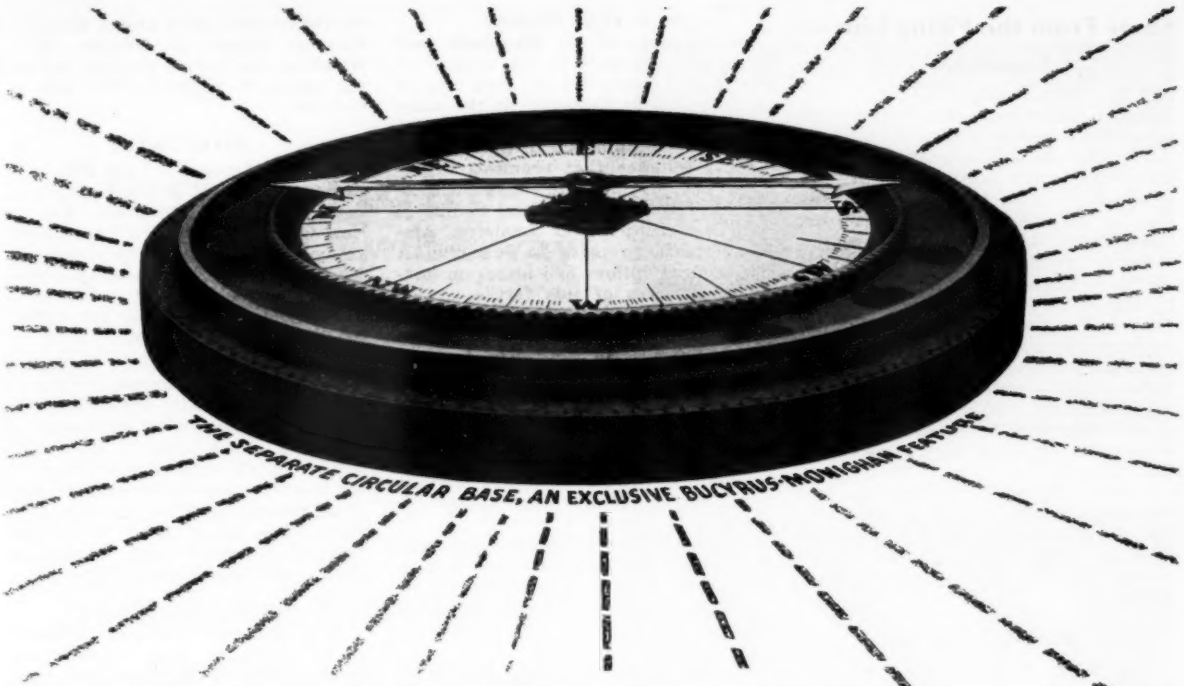
Grant of a $95,000 loan for construction of **Fairport's proposed water supply system purification plant** and 300,000 gallon water tower approved by the PWA Administrator was received. Work will start as soon as bids are opened and contracts awarded. $94,000 was granted to Logan for improvement of waterworks. The Lauer Engineering Company, consulting engineers for the village, is drawing the plans. Included in the project will be the extending of the present water mains and other lines in the distribution system.

Work will soon start on the $252,000 retaining wall around the Parma reservoir at York and Wooster Roads. **The Hunkin-Conkey Construction Company** has the contract. The Cleveland Quarry will supply the brick.

The Metropolitan Paving Brick Company, Canton, reputed one of the largest concerns of its kind in the world, will resume operations at its New Castle (Pa.) plant in April.

Bids will be taken at Norwalk on the **$100,000 cutoff project** planned to eliminate four railway crossings on routes 20 and 18.

Preliminary survey preparations to building a **new $400,000 Lorain Avenue bridge** in Cleveland across Rocky River is under way. Field men from the office of County Engineer McWilliams are busy getting data on location, footings, soil length of span, bow of river and approaches. The data will be ready in three months so that Chief Engineer Birkey of the state



Any Point of the Compass is a "Go" Signal for the Walker!

The Bucyrus-Monighan Walking Dragline can step off from a given point in any one of an infinite number of directions. Simply swing the revolving-frame to point the lifted walking treads, and the Walker's next step is in the desired direction.

Because the Walker is the only excavating machine in the world with a circular base and walking traction, it is the only one that permits this immediate change of direction. Bucyrus-Monighan Company, Chicago, Ill.

BUCYRUS MONIGHAN

Walking Draglines 1 to 10 cubic yards

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Representatives throughout the U. S. A. Branch Offices: Boston, New York, Philadelphia, Birmingham, Pittsburgh, Chicago, St. Louis, Kansas City, Dallas, San Francisco. Offices or Distributors throughout the world.

For your convenience in writing to Bucyrus-Erie Company, you will find a card bound in this issue.

Shots From the Firing Line— *Continued*

highway department in Columbus can begin work on the plans.

The new static test building at Patterson Air Field in Dayton will soon be erected. Excavating will start as soon as possible. The firm of **Gilmore, Carmichael, Olson** has the contract

Sealed proposals were received at the U. S. Engineers Office, Buffalo, until March 27 for furnishing all plant, labor and materials and performing all work required for construction of a **lakeward extension to the west breakwater**, approximately 500 feet long; and construction of a light foundation at the outer end of the proposed west breakwater extension at **Fairport Harbor**, Ohio.

County Surveyor McWilliams said Cuyahoga County would spend $100,000 in **excavating and repairing the drainage system** which has caused trouble on the Superior High Level Bridge.

Michigan Notes

The Great Lakes Dredge & Dock Company, Cleveland, Ohio was awarded the contract, on February 27, for their low bid of $615,350, to dredge 1,985,000 cubic yards from the westerly half of the lower end of the channels in Lake St. Clair.

Illinois Notes

Illinois cities are going to lose their entire share of the gas tax if the plan approved by the majority-party legislative caucus becomes a law. The proposal is to divert the one-half cent now allotted for city from city streets to state schools. It is said that Governor Horner is favorable to the move.

Tennessee Notes

The above illustration shows a part of **Boxley-Bray & Company** road-building operations at the new Morris Dam. These well-known contractors built the 7-mile highway from Coal Creek to the dam site and had to move 275,000 cubic yards of dirt and 30,000 yards of rock to bring the job to grade. A 22-foot concrete slab is included in the contract. The right of way is 250 feet wide and special regulations govern buildings along the highway. In the foreground a Cletrac with a Western bulldozer is spreading some light fill while the Bucyrus-Erie steamer in the background is piling the dirt into the trucks.

By W. BURR CULLOM

Recent tests of the **phosphate rock** found in abundance in the vicinity of Franklin indicate that this rock may be used instead of limestone in the manufacture of steel. **As a result, a new industry is opening up** in this and adjoining counties that promises to become one of the state's largest businesses. The Swann Chemical Company, with a large plant at Anniston, Alabama, plans to move to Franklin. It has secured options and leases on hundreds of acres of this fertile section in the localities in which the underlying phosphate rock is found most suitable for its purpose. The International Agricultural Corporation of New York, as well as the Tennessee Valley Authority have also secured leases on large tracts of land in Williamson County, with the intention of making fertilizer. Cheap electricity from Muscle Shoals is available for power.

Colonel Walter L. Simpson has been appointed CWA Administrator to take the place of C. C. Menzler, resigned. Col. Simpson was formerly the CWA Engineer.

St. Louis and Vicinity

By A. J. KOENIG

Bids were opened Feb. 13 for constructing 4,000 linear feet revetment in the Mississippi River at Danby Landing. **Kansas City Bridge Company** was low with a bid of $91,350. Eleven bidders were present at the letting.

Congress has approved a bill authorizing the building of a **toll bridge across the Mississippi River at Hannibal** by the City of Hannibal. Sverdrup & Parcel, engineers, St. Louis, Mo.

Christy Birt, Decatur, Illinois, was awarded contract for a subway in Macon County, Illinois.

The City of St. Louis **has asked for bids** for the furnishing and laying of 13½ miles pre-cast concrete watermains, 48 to 54 in. diameter. Estimated cost, approximately $1,300,000.

R. McCalman, Incorporated, was awarded contract for a subway under the C. R. I. & P. R. R. in Peoria County, Illinois. **Dungey & Cochran** have contract for a highway bridge in Johnson County. Casey Construction Company is building three bridges in Jackson County. Barrett & McCoy have contract for a bridge in Pulaski County.

Bishop Construction Company has contract for improving 2 miles of road in Vermillion County at a price of $35,882.

The St. Louis & San Francisco Railroad contemplate the laying of about 100 miles of rail; rebuilding bridges and trestles, raising grade of tracks in Mississippi Flood District and bank widening.

The Senate passed a bill creating the **Cairo Bridge Commission** and authorizing it to build a bridge across the Ohio River at Cairo, Illinois.

Kansas City Bridge Company with a bid of $1,035,407 was low bidder for the construction of a bridge across the Missouri River at Omaha. **E. A. Wickham** was low on grading and paving approach highway. The bid was $242,000.

River Notes

During January **7,536,768 cubic yards were placed in levees** in the St. Louis, Memphis, Vicksburg, and 2nd New Orleans Districts. Of this, 6,868,929 yards were placed by contractors, 667,839 by U. S. Engineers. This brings the total yardage placed on Mississippi Flood Control since June 1st, 1928, to 405,704,635 cubic yards .

The Mississippi River Commission has released **official figures** for the calendar year of 1933. There were 51,000,000 cubic yards of earthwork under NRA which went at an average price of 23.61 cents and 10,300,000 cubic yards under Flood Control funds at an average of 17.04. Average prices since 1928 were: 1928, 26.50 cents; 1929, 23.17 cents; 1930, 23.12 cents; 1931, 15.40 cents; 1932, 14.19 cents.

Memphis District

An additional allotment of $55,000 permitted Major Hoge to recommend awards from the January 26th letting of 770,000 yards at 26.45 cents to **Clarke Brothers Construction Company** of Clinton, Iowa; 790,000 yards at 27.37 cents to **Morrisey Construction Company** of Fayette, Mississippi; 535,000 cubic yards at 32.80 cents to **Forcum-James Construction Company** of Dyersburg, Tennessee.

Vicksburg District

All bids received February 15th for the construction of 780,000 cubic yards of earthwork in the Old River landslide enlargement, nine miles above Lake Provide, La., have been **rejected** by the U. S. Engineers, and new bids for the project will be received March 28th.

Forcum-James Construction Company of Dyersburg, Tennessee, submitted the low bid on March 1st on the 42,000 cubic yards of earthwork in Monroe New Levee North, Phillips Bayou, Ouchita Parish, La. Their bid is 23.7 cents per yard with the government estimate of 50.27 cents.

R. T. Clark—John Noble of Fayette, Mississippi, were low bidders at 34.47 per yard on 780,000 yards of old river landside enlargement in East Carroll Parish, Louisiana, at bidding February 15th.

New Orleans District

Specifications for the construction of approximately **6,000,000 cubic yards of earthwork** on the Mississippi River main line levees being prepared at New Orleans, include 1,700,000 yards in the Ferriday ring levee; 3,300,000 yards at Vidalia Point, and 1,000,000 yards at Philadelphia Point. It is hoped that specifications may be issued at an early date and bids received during the first part of April.

If and when Congress passes the Overton and Dear bills authorizing the

Start it right
and it will always reel right

Start it wrong
and the positive result is early destruction

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...This is a helpful hint, how to make wire rope last longer. Subsequent Wickwire Spencer advertisements in this publication will give other dollar saving information. Tell us about your rope problem and we will give you the answer.

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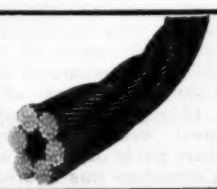


For your convenience in writing to Wickwire Spencer Steel Company, you will find a card bound in this issue.

Shots From the Firing Line—*Continued*

reimbursement of Atchafalaya levee boards for the purchase of right-of-way, the New Orleans office is anxious to bring out 7,475,000 cubic yards in the Hamburg-Palmetto levee and 2,600,000 cubic yards in the Melville ring levee.

South Dakota Notes

By PAUL G. FRIGGENS

Letting contracts totaling $380,000, the South Dakota State Highway Commission has furthered another step in its road program, and active work on the various projects is expected to get under way in the next few weeks, Frank Kriebs, secretary, has announced. The awards by counties and companies include: Grading — Gregory County, 5.031 miles to **Weidneck, Johnson & Duffy**, Winner, $13,963; Charles Mix County, 7.118 miles to **Booth & Olson**, Sioux City, $16,318; Douglas County, 9,849 miles to **England, England & England**, Murdo, $27,694. Bridge Construction—Jones County, treated timber 25-ft. and 29-ft. to **Ole Williamson**, Ft. Pierre, $4,074; Pennington County, treated timber 15-ft. and 75-ft., to **Ole Williamson**, Ft. Pierre, $5,082; Charles Mix County, 48-ft. to **Queen City Construction Co.**, Sioux Falls, $4,918; Douglas County, 48-ft., 52-ft. and 2BC (10x6) to **Queen City Construction Co.**, $11,026; Haakon County, treated timber 58-ft. to **Ole Williamson**, $3,323.

Gravel, base course—Jones County, 4.972 miles to **S. S. Roberts**, Flandreau, $10,737. Gravel surfacing — Faulk County, 9.636 miles to **Central Construction Co.**, Sioux Falls, $17,909; Moody County, 3.027 miles to **Robert Backhaus**, Madison, $3,762; Brookings County, 4.722 miles to **Robert Backhaus**, Madison, $1,894. Resurfacing—Grant County, 16.456 miles to **Yant Construction Co.**, Omaha, $8,032; Jackson and Mellette Counties, 22.47 miles to **Martin Joyce**, Brandon, $15,758; Grant County, 10.894 miles to **Yant Construction Co.**, Omaha, $7,777; Hamlin County, 6.975 miles to **Robert Backhaus**, Madison, $5,590.

Fort Peck Notes

Morrison-Knudsen Company were low at $108,950 on the gravel roads for Fort Peck Dam construction at the letting held by the U. S. Engineers at Kansas City, March 8th. The work includes 203,208 yards of common excavation which the low bidders figured at 25 cents. 187,225 station-yards of overhaul was figured at 3 cents, 59,137 square yards of 10-inch gravel base course estimated at 20 cents and 59,500 square yards of 6-inch gravel at 15 cents. 118,637 square yards of gravel wearing surface and 74,558 square yards of gravel wearing surface on shoulders was figured by Morrison-Knudsen at 7 cents.

Pit run gravel bids for **roads at Fort Peck Dam** opened at Kansas City Mar. 8th showed J. R. Shiely Company of St. Paul low at 50 cents per yard on the 35,000 yards required. Bids ranged up to $2.50 and $2.75 per yard.

Bids are being asked on April 11 for **four tunnels** at Fort Peck Dam site, southeast of Glasgow, by the Division Engineer of the Missouri River Division.

Wyoming Notes

By PAUL G. FRIGGENS

Construction of the 22-million-dollar **Casper-Alcove irrigation project** moved a step nearer in March with the opening of bids at Casper for $610,000 worth of work on the main canal. The construction of headgates and a part of the canal, called for in the bids, will provide employment for approximately 400 men. Bidding was on three separate schedules which, combined, constitute the present canal program. They call for construction of canal headworks, two tunnels through rock and sandstone, two siphons, one 300 feet in length, a 75-foot concrete bridge spanning the canal, where it will cross the Casper-Rawlins highway, as well as the excavation and earthwork of 2.8 miles of canal. Low bidders were: **Utah Construction Company** of Ogden, Utah, $226,000; **J. T. Terteling & Sons** of Boise, Idaho, $90,000; **Edward Peterson** of Omaha, Nebraska, $294,000.

Nevada Notes

J. A. Casson of Oakland, California, with a bid of $55,531 was awarded the contract for constructing a State Highway in Douglas County between Minden and 4 Miles South.

U. B. Lee, San Leandro, California, was awarded the contract for improving 31 miles of the State Highway System in Nye County south of Beatty, their bid being $54,354.

Isbell Construction Company, Carson City, was awarded the contract for constructing the portion of the State Highway System in Mineral County, between the California-Nevada State Line and Basalt, for their low bid of $116,510.

Grand Coulee Notes

By KARL STOFFEL

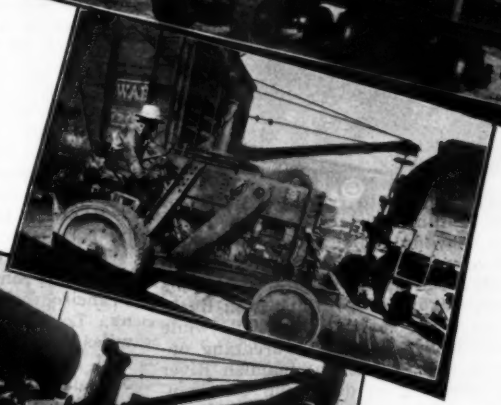
At the close of the day on March 8, **preliminary excavation work on the Grand Coulee contract was 60.9 per cent completed** and 42.7 per cent of the 150 days allotted time was used up, according to the progress chart kept by E. Paul Ford, general superintendent for the David Ryan Company. A new record for a single day's hauling was also set up on that date when Goodfellow Brothers, Inc., of Wenatchee, west side excavators, dumped 13,088 cubic yards of material, breaking the previous high mark of 11,900 yards set January 25. Of the entire job, 1,234,403 yards have been moved out of the 2,100,000 contracted. The contractors were 26 days ahead of schedule on March 8.

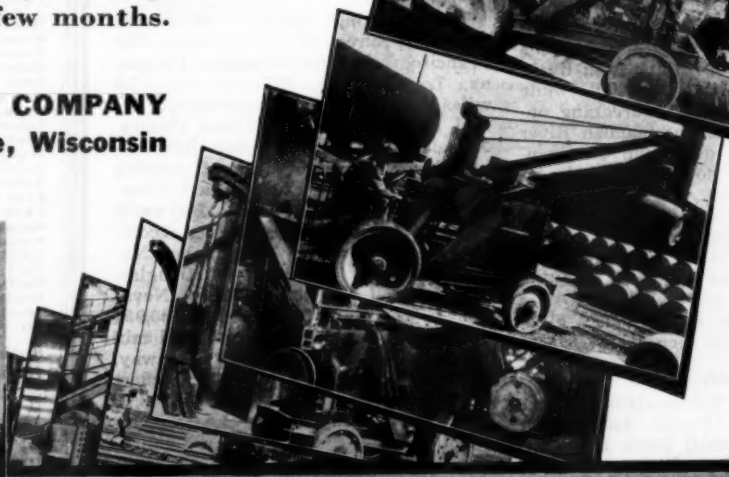
The Western Construction Company of Seattle was low bidder March 8 for the excavation and construction of two piers of the cantilever bridge across the river at the dam site. Their figure was $180,177. Included in the contract was: 140 linear feet of depth excavation for two piers; 8,230 yards of concrete; placing of 57,000 pounds of reinforcement bars; placing of 13,000 pounds of pier nose angles. The two piers to be constructed are to be 148 feet and 132 feet above bedrock. The bridge will be 950 feet long and the center span 550 feet.

Bids were to be called for building of the $63,000,000 low dam about April 1. With the present excavation contract expected to be completed about May 1, nearly a month ahead of schedule, excavating work will probably go on

Dirt moving operations at Grand Coulee Dam.

19 *Loadmasters* for the Missouri Pacific Lines...





THE Missouri Pacific Lines bought their first Loadmaster in August, 1929. It proved so successfully applicable to this company's material handling problems that a second order for three machines followed early in 1930. Then came others: nine more in 1930, one in 1931, one in 1932, one in 1933, and three in 1934. Today there are 19 Loadmasters at work in various departments along the lines of this progressive railroad and its subsidiaries. The Loadmaster fits almost any material handling job . . . . saves time . . . saves money. Wheel or crawler mounted . . . capacity 5,000 pounds . . . full revolving boom. On many installations savings made by this extremely versatile crane repay the original investment in a few months.

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BUCYRUS ERIE LOADMASTER

Shots From the Firing Line—*Continued*

practically uninterrupted, Frank A. Banks, construction engineer believes. Mr. Banks also said the big contract would include both the remaining excavating and the pouring of concrete.

By C. J. McCARTHY

Bids will be taken at the Spokane office of the Bureau of Reclamation on April 5th for construction of a highway from the head of Grand Coulee to the Columbia River Bridge and a railroad from Grand Coulee to the damsite and for grading streets in the camp. The work is about 20 miles northwest of Almira. It includes 456,500 cubic yards of all classes of excavation, 7,133,000 station-yards of overhaul, 1,500 yards of backfill, and other items.

Seattle and Vicinity

Adaptability to various types of work is illustrated in the above pictures showing a Bucyrus-Erie ½-yard 21-B operated by District No. 3, King County. The upper picture shows this machine equipped with an Owen Bucket operating as a clamshell while mounted on a scow. This dredging operation was on the Sammamish River and consisting of deepening the channel to avoid over flowing at flood season. During recent years this stream has caused considerable damage by overflowing its banks in the winter. The lower view shows the same machine operating as a shovel, cleaning up a bad clay and mud slide that buried one of the King County highways up to 25 feet deep.

Oregon Notes

The Bureau of Reclamation will take bids at Ontario, Oregon, April 5, for work on the Mitchell Butte lateral of the Owyhee project. The work is located near Nyssa and Ontario, Oregon, and includes 53,700 cubic yards of excavation for structures; 36,500 cubic yards of backfill; 6,870 cubic yards of concrete; 1,250 square yards of dry-rock paving; together with installing of gates and miscellaneous metal and concrete pipe work.

The Bureau of Reclamation will take bids at Stanfield, Oregon, on April 3 covering construction of siphons and tunnel canal, earthwork and structures for drain No. 1 of the Stanfield project near Stanfield. Included are 55,650 cubic yards of all classes of open cut excavation, 1,200 cubic yards of tunnel excavation, 6,000 cubic yards of backfill, together with other items.

California Notes

By H. L. LIVINGSTON

The City of San Jose will hold an election May 21 to ratify an agreement between the City Council and Water Properties Company, Ltd., to deliver water at the rate of 11 million gallons daily by July, 1937. This work involves a dam at French Meadows, near Lake Tahoe, a 200 mile pipeline and power houses. The estimated cost is $50,000,000. A PWA loan of $35,000,000 is being sought.

A call for bids will probably be issued in June for construction of the Camp Verde Dam on the Verde River, Arizona, by the Bureau of Reclamation, Denver. This project will bring about 80,000 acres of land under cultivation. The proposed construction will consist of dams, reservoirs, canals, lateral systems and power development. The total estimated cost of this project is $18,912,000.

The U. S. Engineers Office in Los Angeles has completed specifications for the construction of jetties at the entrance to Newport Bay Harbor. The total cost of this project is estimated at $1,835,441. The West jetty extension is 675 ft. long and will contain 43,200 cu. yds. of Class 'B" stone and 75,500 tons of Class "A" stone. The East jetty extension is 950 ft. long and will contain 20,000 cu. yds. of Class "B" stone, 86,000 tons of Class "A" stone and 9,200 tons of Class "C" stone.

The following contracts have been let by the Bureau of Public Roads, San Francisco: Morrison-Knudsen Company, Los Angeles, $177,522 for 17.6 miles of grading and surfacing, Federal Lands Highway in Clark County, Nevada. E. L. Yeager, San Bernardino, $50,671 for 3.6 miles of grading the Dixie National Forest, Clark County, Nevada. Jack Casson, Hayward, $106,086 for 10.11 miles placing decomposed granite on the Lake Tahoe National Forest Highway in Douglas, Ormsby and Washoe Counties, Nevada. L. G. Kipp, Sacramento, $30,954 for 5.19 miles of bituminous road mix on the Mount Rose Forest Highway, Washoe County, Nevada. A. Teichert & Son, Sacramento, $134,538 for 13.15 miles of grading in the Lassen National Forest, Shasta County. Hanrahan Company, San Francisco, $93,961 for 18.3 miles of gravel subgrade reinforcement in the Lassen National Forest, Shasta County. M. J. Bevanda, Stockton, $351,298 for 10.7 miles of grading on the Kingham Boulder Dam Highway, Mohave County, Nevada. Hemstreet & Bell, Marysville, $106,488 for grading Section "A" in the Sierra National Park, Madera County.

The California Division of Highways has awarded the following contracts for work in the State of California: Griffiths Company, Los Angeles, $168,587 for 15.4 miles of grading and asphalt concrete paving between Williams Ranch and Summit. Oswald Bros., Los Angeles, $63,923 for 0.8 mile grading and paving in Los Angeles. C. O. Sparks, Los Angeles, $181,791 for 1 mile grading and concrete paving in Los Angeles. C. W. Wood, Stockton, $105,530 for 2.9 miles grading and fuel-oil treating in Ventura County.

Bids which were to have been opened on March 22 for constructing the Broadway Low Level Tunnel and Highway in Alameda and Contra Costa Counties have been postponed until late in April. This was due to the fact that the bond issue covering this project had to be validated before the Supreme Court. The estimated cost of this tunnel and highway is $3,800,000.

During an intense love scene in the movies, when the hero was doing his stuff, wifie nudged her contractor-husband and said: "Why is it that you never make love to me like that?"

"Say," he replied, "do you know the salary that guy gets for doing that?"

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Injectors	Power Transmission Cable
Brake Linings	Dragline Rollers
Wood Blocks	Dragline Buckets
Asbestos Fabric	Lighting Plants
Asbestos Blocks	Fire Gun
Fire Box Arches	Repair Washer
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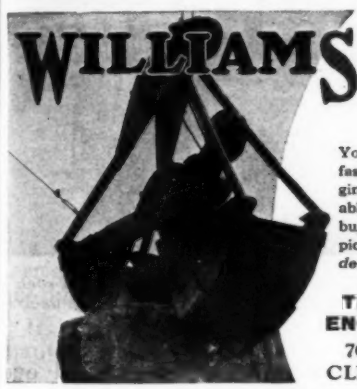

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You'll be able to plan your loads to move the maximum amount of rock. You'll get more work out of your explosives, for each charge will be in contact with the detonating agent throughout its entire length. You'll be able to keep the drills, lines, compressors, shovels, and other equipment on the job until you're ready to fire all the holes at one time. And you'll move MORE YARDS MORE ECONOMICALLY.

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Ensign-Bickford Safety Fuse is available in a number of standardized brands, each carefully made for a particular set of conditions. The use of Safety Fuse simplifies blasting technique.

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Drill Before You Weep

(Continued from Page 179)

A Swamp "Full of Building Sand" Took This Banker's Money

It was during the post-war period when money was plenty and all of us were looking for the big pickings, the sure things. Somebody told a banker about the chance to clean up on building sand for use in a large eastern city. There was no sand suitable for building within miles and miles. A sure fortune awaited the man who could give quick truck delivery. His informant claimed to have an option on a large deposit of white sand which had been overlooked because it was located in a swamp. The sand could be used for any kind of building purposes and was also within a short haul by truck of the city.

The banker took a hurried trip and saw the sand deposit himself. It looked good to him. In fact it seemed to be one of those chances too good to tell his partners about. Time enough later when he had piles of money made from piles of sand. Because he wanted to keep everything to himself, he was extremely careful whom he asked advice from, about his equipment, etc. The last man he wanted to talk to was anyone who knew much about dredging sand. He was afraid his secret might be stolen. If he did not know much about getting out sand, he did know all about fitting up an office. When he got through with the offices for the sale of sand from his swamp, it was one to please even a banker's eye. As there was a delay in getting the pump delivered, he guarded against any further delay in getting trucks, by buying four. Each was painted and lettered with the name of the sand company and the telephone number. As he had been assured by the man who sold him the lease on the sand deposit that anyone who could supply the sand needed in the city would be sitting pretty, he wanted one of those pretty seats.

The sand "mine", being in a swamp, required the building of nearly a half mile of planked road to make hauling safe for trucks. The plan was to pump directly into them. Finally the barge was completed, the dredging pump installed, and the road finished. Fresh flowers were put on the office desks and a case of "mineral water" opened for the special dinner for the invited guests, who were to witness the dredging of the first truck load of sand.

You might say that the band played when the pump was started sucking. But not for long. It soon stopped with a dismal wail from lack of sand to suck. Why? Well, because all of the elaborate preparations had been based really on but a scant foot of sand lying on top of blue clay of the hardest kind. Believe it or not!

Later on some friends and I bought the dredge pump and that is how I know about the pathetic failure. No one concerned ever once thought about drilling, or even pushing a stick down in the sand. Perhaps it was thought that drillers might get their feet wet.

In California . . . looking for bed rock at Pine Canyon Dam with a Bucyrus-Armstrong 33.

Drill Holes in Limestone Proved Jokers in This Case

Even when you do use a churn drill to explore where you are going to dig, you can get fooled sometimes then, if you are not careful. Nature seems to delight in fooling everybody every time she can. A man who had made a reputation as a quarryman elsewhere, started to explore and to locate a calcite deposit in a limestone region. A good market was ready and waiting for the product. A good churn drill was put to work making test holes. Somehow all of these were made in an east to west direction. The results were so pleasing that when the results from the second line of holes, made at about 100 feet distant from the others, checked with the first as to quality of stone and depth of deposit, enough money was freely spent to open up the quarry and get into production.

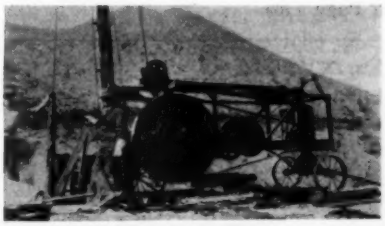
It was not until a transverse cut was made for drainage that

Grand View Mines prospect for lead and zinc near Metaline Falls, Washington.

the true condition of the stone was discovered. If others knew about it, they had kept very close mouthed about it. You see the lime stone formation in the region is like the waves of a high running sea. Coming up close to the surface in long east to west lines, it then drops down between the crests. By bad luck, the holes put down to find out how things looked under the ground had followed along one of the crests. Then the devil himself must have started the second line of holes smack on top of the parallel crest. Of course, the results from the tests were pleasing. They couldn't show better!

The cost of removing the overburden between the ridges was more than the sales price of the stone could bear, so the owners folded their check book and went away. The lesson from this story, also true, is not to be partial to any points of the compass when you start out to find out about what you can not see. Drill, ye terriers, drill, and in more than one line.

If you have no drilling equipment of your own available, call in the nearest well driller with modern equipment and ask him to estimate the cost of test borings. Or perhaps it's a job for a



Sinking test pits along route of the Colorado River Aqueduct in Moronga Canyon, California.

diamond drill or merely test pits. But remember it pays to have some real evidence of conditions under the surface before you tackle much of an excavating job or invest money in any sort of underground deposit.

New Suburban Gardener: "I don't seem able to tell my garden plants from weeds. How do you distinguish between them?"

Old Farmer: "The only sure way is to pull 'em out. If they come up again, they're weeds."

We're told that in the Eskimo language, "I love you" is "Univfgssaerntuinalfinajuanjuarisiguejak."

Which explains why the Arctic nights have to be so long.

Sunday School Teacher: Who was the mother of Moses?

Little Mary: Pharaoh's daughter.

S. S. T.: But she found him in the bullrushes.

L. M.: That was her story.

"I wanna come in."

"No, you can't come in."

"Why can't I?"

"'Cause Mamma says boys should not see little girls in their nightgowns."

Short silence. "You may come in now, I took it off."

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P&H-HANSEN ARC WELDERS

BACKED BY 50 YEARS OF EXPERIENCE

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

Excavating the TAWA Flat Tunnel

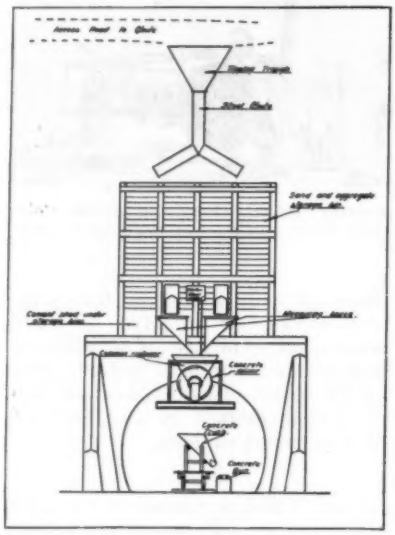
(Continued from Page 173)

at Ngahauranga, between No. 2 and 3 portals, the other at No. 4 portal. No. 1 station has three 800 cubic foot and one 600 cubic foot machines, No. 2 station has three 800 cubic foot machines and two 300 cubic foot machines. The air is laid from the compressor sheds to the enlargement faces in 6″ mains, and to the headings in 2″ pipes. With such a length of pipe it is necessary to keep a close watch on leaks, particularly as a hundred cubic feet of air per minute at 80 pounds represents 20 h.p. In order to be able to observe this a meter has been put on the main in such a position that all the air passing can be diverted through the meter and so measured. This is carried out from time to time on Sundays, when no machines are working, and so the air passing represents the leakages. In this connection passing reference should be made to the victaulic joint, which has given every satisfaction, not only from the point of view of tightness, but with the ease and speed with which the joints are made and broken.

The system of ventilation is exhaust throughout. Various small fans were installed on the shorter headings, but provision made is three fans for the delivery of 3,000 cubic feet per minute at 8,000 foot distance, thus allowing the regulation requirement of 150 cubic foot of air per man for 14 miners, with a loss of efficiency, due to bends and faults in the suction pipe of 33%. A reading with the anemometer, with 4,100 feet of suction, shows a loss of 6%. The suction pipe is 20″ in diameter, and the fan is 17½″ Sirocco, with an 18 h.p. motor. The air conditions at the face are also improved by the exclusive use of electric light, and the exhaust from the pneumatic machinery.

Timbering Highly Important Owing to Broken Strata

Due to the dangerous and variable nature of the ground it was necessary to timber the whole tunnel immediately after excavation. The five arch segments in the heading were each 8 feet long and the wall sticks were 12 feet long. A longitudinal sill was placed between the arch segments and the wall section. The timber employed was 10″x 10″ pinus insignis. Maximum spacing of the sets was 5′3″ and at times it was found necessary to place them at 1′4″ centers in order to avoid caving.



Sketch of the gravity-system of concrete-mixing plant employed at the tunnel entrance.

Putting in the Concrete Lining

As soon as the excavation is completed concrete lining follows as promptly as possible. Concrete is supplied from three mixing plants located at numbers 1, 3 and 4 portals and in laying out of these plants every effort has been made to eliminate the manual handling of materials.

The mixers are 21-14 cubic foot machines and the trucks carry 1½-yards. At the start of the work considerable difficulty was experienced because in traveling from the mixer to the concrete gun it was found that the vibration settled the mix forcing the water to the top making it hard to start the concrete pouring when the doors were opened at the start of the run. This difficulty was overcome by using trucks equipped with Standard railway springs and resulting in the mix being delivered at the gun in a homogenous mass.

The gun, of 14-cubic-foot capacity, operates under 90-pound air pressure and has been successfully used for a delivery of

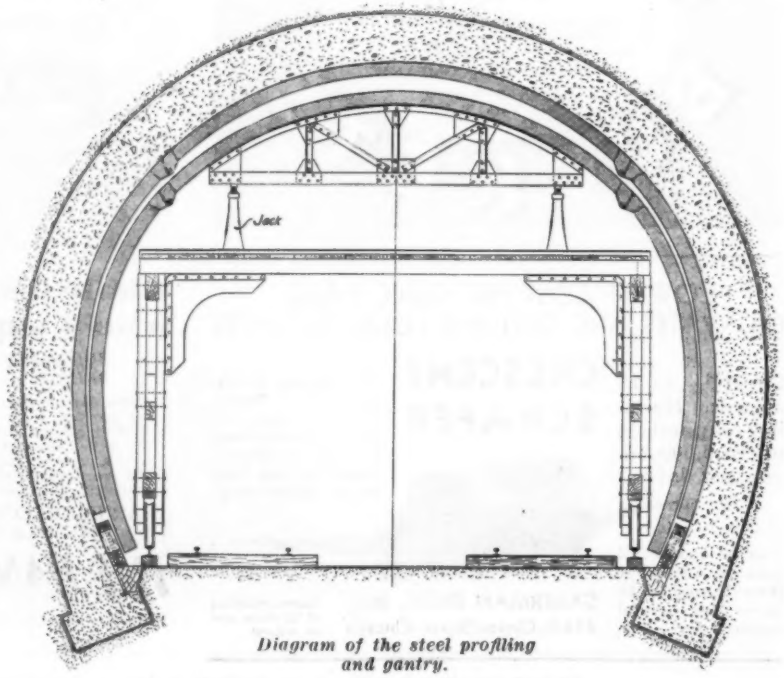
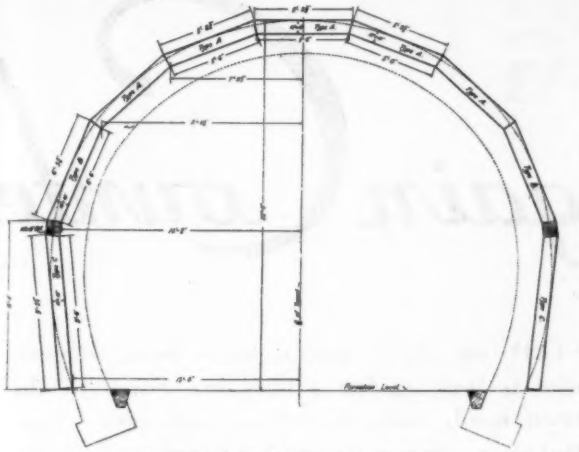


Diagram of the steel profiling and gantry.



Method of timbering the tunnel.

260 lineal feet. It has been found advisable to keep delivery as short as possible, owing to the wear and tear on the pipes and the increased risks of blockages as the pressure drops.

Steel sheathing is used for forms for the concrete lining, the minimum allowable clearance between the steel and wood being 14". The whole of the concrete except the footings and the bottom 2' of walls is placed pneumatically. The footings are poured first, then the drain sticks and the wall forms are set and the concrete run in as high as possible directly from the trucks. The gantry is then moved into position and the profiling set up, the necessary accuracy being obtained by means of wedges off the wall forms.

This profiling consists of 3/16 inch plates riveted on the 6x3 joists and hinged in such a position that the sides can be pulled in and the whole section lowered on the gantry jacks. When the jacks are lowered about 14" the collapsed sections can be moved through sections still holding green concrete to positions required for further concreting. Provided the profiling is kept clean and given an occasional coat of oil, no difficulty is experienced in stripping the work.

The work is carried on continuously, from midnight on Sunday until 4 p.m. on Saturday, and accommodation is provided for all shift workers. Two main camps have been established, one at Khandallah and one at Glenside. Married men have small but comfortable three-roomed cottages, and single men 10x8' huts. In large, well-appointed cook-houses the single men are catered for, meals being provided at all hours to suit the changing of shifts. At the tunnel portals, change and drying rooms, fitted with hot and cold water and showers, have been erected.

The tunnels and other formation work on the deviation were completed in Nov. 1933, and platelaying and electrification is now being carried out. The deviation will probably not be used until the completion of the new Wellington Station and yard, now in course of construction.

Equipment You Ought to Know About

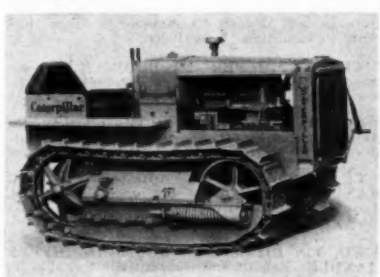
(Continued from Page 183)

gear ratios and tire sizes all receive proper consideration in solving any problem. One side of the rule, which is of convenient pocket size, is printed in black and is used for load pulling and grade climbing determinations. the other, printed in red, is used for speedy calculations. The operation is extremely simple, the directions being clearly printed on the rule.

This slide rule is not limited to Reo Speed Wagons and Trucks. It can be used to calculate the load pulling ability, speeds, and other performance factors on any make or model of truck, when the gear reduction, torque (or horsepower), tire size, weight, etc., are known, or can be approximated fairly closely. If further information is desired, write *Reo Motor Car Company, Lansing, Michigan.* Please mention *Excavating Engineer.*

Caterpillar Twenty-Eight Tractor

CATERPILLAR TRACTOR COMPANY recently announced the Twenty-Eight Tractor to succeed the model Twenty-Five. The new machine incorporates all the features of design and construction that have made the Twenty-Five so popular, plus the advantages of increased power and weight.



"Caterpillar" Twenty-Eight.

The four cylinder, valve-in-head engine has a bore and stroke of $4\frac{3}{16}$" x $5\frac{1}{2}$" and develops a maximum of 30.49 H.P. at the drawbar and 37.47 H.P. at the belt, according to the manufacturers. Ground contact, with standard tracks, is 1,251 square inches and shipping weight is 7,870 pounds. Complete specifications or other desired data will be sent any interested reader upon request to *Caterpillar Tractor Company, Peoria, Illinois.* Please mention *Excavating Engineer* when writing.

CoMaX Brake Lining Announced

AVAILABLE in all sizes up to six inches wide and one inch thick, Wagner CoMaX, a brake lining claimed to possess exceptional characteristics, has recently been announced by the *Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, Missouri.* It is described as non-compressible under pressure, allowing brakes lined with CoMaX to run for long intervals without adjustments, easy on drums as it contains no abrasive material, quiet, smooth, and age-proof.

In addition to the CoMaX line of automotive lining, Wagner Electric has another line known as Wagner HC for use on machinery. This line includes lining up to 12 inches wide and one inch thick in roll form and in any flat or curved form beyond those sizes. When writing Wagner Electric Corporation regarding either the CoMaX or the HC line of frictions, please mention *Excavating Engineer.*

EXCAVATING ENGINEER *Bargain Counter*

★ ★ ★ **THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.**

SHOVELS-CRANES DRAGLINES

P&H MODEL 208—45′ BOOM DRAGLINE Cats—15½′ long, 9′ wide, 22″ Treads. 100 HP. Waukesha High Alt. Engine. SCD-1.

AMERICAN 1 CU. YD. GASOLINE SHOVEL. Motor overhauled 1932. Good value. SCD-8.

P&H MODEL 208—45′ BOOM DRAGLINE— 4-cylinder 7¾″x9″ Twin City gasoline engine and 1½ cu. yd. Omaha bucket. SCD-20

BUCYRUS-ERIE 30-B DIESEL 40′ BOOM DRAGLINE. SCD-21

MONIGHAN MODEL 1-W, WALKER — 60′ Boom Dragline, 1¼ cu. yd. Page Bucket. Good condition. SCD-13.

OSGOOD 1½ CU. YD. STEAM SHOVEL CAT. MOUNTED. Good operating condition. SCD-22

BUCYRUS-ERIE MODEL 30-B DIESEL SHOVEL— 25′9″ Boom, 14′ Dipper Handle, 1 yd. Dipper. SCD-9.

KOEHRING MODEL 1—30′ Boom Gasoline Crane. Cat Mounted—No Bucket—4½″x5″ Wisconsin Engine. SCD-19

BUCYRUS-ERIE SLIGHTLY USED-LOAD-MASTER TRACTOR CRANE—14′ Boom—Rubber tired wheels—Rated lifting capacity 4500 lbs. McCormick-Deering Power Unit—New Machine Guarantee. SCD-17

Shovel Equipment

¾ CU. YD. DIPPER—20′ boom—13′ Dipper Handle—rope crowd shovel equipment. Suitable for models 1030 or 1035—brand new. SE-1

¾ CU. YD. DIPPER—23′ BOOM—15′ DIPPER HANDLE—Extra High Lift Rope Crowd Shovel Equipment suitable for Models 1030 or 1035. Brand New. SE-2.

¾ CU. YD. DIPPER—23′ BOOM and ENGINE —13′6″ DIPPER HANDLE—Shovel Equipment suitable for 20-B Steam. Brand New. SE-15.

COMPLETE FRONT END EQUIPMENT

¾ CU. YD. DIPPER—26′ BOOM and ENGINE —17′ DIPPER HANDLE—High Lift Shovel Equipment suitable for 30-B Steam. Brand New. SE-16.

¾ CU. YD. DIPPER—25′9″ BOOM—14′ DIPPER HANDLE—Shovel Equipment suitable for 30-B Diesel. Brand New. SE-17.

¾ CU. YD. DIPPER—21′9″ BOOM and ENGINE—15′ DIPPER HANDLE — High Lift Shovel Equipment. Suitable for 31-B Steam. Brand New. SE-18.

1 CU. YD. DIPPER—20′ BOOM—15′ DIPPER HANDLE — Rope Crowd Shovel Equipment, suitable for Osgood "Conqueror." Good mechanical condition. Low Price. SE-24

1 CU. YD. DIPPER—26′ BOOM—15′ Dipper Handle—Rope crowd shovel equipment. Suitable for D-2 machine. Brand new. SE-3

1 CU. YD. DIPPER—23′ BOOM—12′6″ Dipper Handle—Rope crowd shovel equipment. Suitable for D-2 machine. Brand new. SE-4

1 CU. YD. DIPPER—24′ BOOM—18′ DIPPER HANDLE—Slightly used but good conditioned. Suitable for any Bucyrus-Erie GA-2 or GA-3 Machine. SE-25.

1 CU. YD. DIPPER—24′ BOOM—16′ DIPPER HANDLE—Rebuilt and Guaranteed. Suitable for application Bucyrus-Erie GA2 or GA3 Machines. SE-26

1¼ CU. YD. DIPPER—22′6″ BOOM—16′ DIPPER HANDLE—Rebuilt and Guaranteed. Suitable for application Bucyrus-Erie GA2 or GA3 Machines. SE-27

1¼ CU. YD. DIPPER—25′ BOOM—17′ DIPPER HANDLE—Slightly Used Rope Crowd High Lift Shovel Equipment suitable for Model 37-B. New Machine Guarantee. SE-5.

1½ CU. YD. DIPPER—23′6″ BOOM—15′ DIPPER HANDLE—Slightly Used Rope Crowd Shovel Equipment suitable for Model 37-B. New Machine Guarantee. SE-6.

1½ CU. YD. DIPPER—27′ BOOM—17′ DIPPER HANDLE—High Lift Rope Crowd Shovel Equipment suitable only for Bucyrus-Erie 43-B machines. Rebuilt—New Machine Guarantee. SE-23.

1½ CU. YD. VANDERHOEF FRONT DIPPER —21′ Boom—15′ Dipper Handle—Steam shovel equipment complete—Suitable for 41-B or 42-B. Rebuilt—New Machine Guarantee. SE-28.

Dragline Equipment

35′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2. DL-2.

40′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2. DL-3.

40′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model E-2. Brand New. DL-6.

45′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model E-2. Brand New. DL-7.

40′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model 30-B Diesel. Brand New. DL-8.

45′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model 30-B Diesel. Brand New. DL-9.

BRAND NEW Ropes included with each of above Dragline Equipments.

All of above equipment is BRAND NEW and of BUCYRUS-ERIE manufacture.

Trench Digging Equipment

¾ CU. YD—36″ WIDE SOLID TYPE DIPPER, 21′ Boom, and all auxiliary equipment for application to Model 1030. Will dig to maximum depth of 18′. Rebuilt—New Machine Guarantee. DS-3

1 CU. YD. 42½″ WIDE—Solid type Dipper—24′ Boom and all auxiliary equipment. Will dig maximum depth 22′. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5

BRAND NEW PAGE, two dippers each ¾ cu. yd., one 38″ wide over cutters, the other 49½″ wide over cutters. 17′1½″ Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

1-CU. YD. 42½″ WIDE SOLID TYPE DIPPER —24′ Boom and all auxiliary equipment—will dig maximum depth of 22′—For application to GA-2 or GA-3 Clam Shell or Drag Line. Rebuilt —New Machine Guarantee. DS-8.

BRAND NEW Ropes included with each of above Trench Digging Equipments.

Address all inquiries to Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.

DIPPERS

Small Machines

2 ⅝ CU. YD.—Plate.—Will fit 20-B Steam or Gas. Brand New. D-12

1 2/3 CU. YD.—Plate front.—Will fit 14-B. Brand New. D-13

1 ¾ CU. YD.—Rock Type.—Will fit 20-B Steam or Gas. Brand New. D-15

2 ¾ CU. YD.—Plate front.—Will fit 1030 or 1035. Brand New. D-16

2 ¾ CU. YD.—Cast Front Inserted Tooth. Will fit 1030 or 1035. Brand New. D-17

2 ⅞ CU. YD.—Plate front.—Will fit 1030 or 1035. Brand New. D-18

1 ⅞ CU. YD. CAST FRONT INSERTED TOOTH DIPPER. Will fit 1030 or 1035. Slightly used. D-36

1 ⅞ CU. YD. CAST FRONT INSERTED TOOTH DIPPER. Will fit 1030 or 1035. Brand new. D-37

1 ⅞ CU. YD. Cast Front Inserted Tooth. Will fit B—B-2—B-3 and GA-2. D-19

1 ⅞ CU. YD.—Plate Front. Will fit 18-B. Brand New. D-20

1 ⅞ CU. YD.—Rock type. Will fit 31-B. Brand New. D-21

2 1 CU. YD.—Cast Front Inserted Tooth Dippers. Rebuilt and Guaranteed. Suitable for application GA2 or GA3 Machines. D-34

3 1¼ CU. YD.—Cast Front Inserted Tooth Dipper. Rebuilt and Guaranteed. Suitable for application GA2 or GA3 Machines. D-35

1 1¼ CU. YD.—Plate front. Will fit E-2, 41-B or 42-B. Slightly Used. D-26

2 1¼ CU. YD.—PLATE FRONT. Will fit E-2. Brand New. D-27.

1 1¼ CU. YD. CAST FRONT INSERTED TOOTH DIPPER. Will fit 37-B. Slightly used. D-38

1 1½ CU. YD.—PLATE. Will fit E-2. Brand New. D-28.

1 1½ CU. YD. CAST FRONT INSERTED TOOTH DIPPER. Will fit 43-B. Slightly used. D-39

2 1½ CU. YD.—Manganese Front Inserted Teeth. Will fit E-2, 41-B or 42-B. Slightly Used. D-29

1 1½ CU. YD.—Vanderhoef type with Vanderhoef teeth. Will fit E-2 or 42-B. Slightly Used. D-30

Large Machines

1 2½ CU. YD.—Front 2¼" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Can be used on 68-C and 70-C machines. Brand New. D-1.

2 3 CU. YD.—Front 2½" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Can be used on Model 100-B, 68-C, 70-C Machines. Brand New. D-2.

1 3½ CU. YD.—Front 2¾" Nickel Chrome Steel, two part Van Port Reversible Teeth. Can be used on Model 88-C, 95-C, Class 180. Brand New. D-3.

1 4 CU. YD.—Front 2¾" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Has seen some service but in good condition. Can be used on Model 100-C, 120-B. D-4.

1 4½ CU. YD.—Lip 2¼" Manganese Steel, two part Reversible Manganese Teeth. Can be used on Model 88-C, 110-C. Brand New. D-5.

3 6 CU. YD. Molybdenum Steel Front, Annealed Cast Steel Back, two part Reversible Van Port Teeth. Can be used on 225-B and 320-B. Brand New. D-11.

1 8 CU. YD.—Front Molybdenum Steel, two part Van Port Reversible Teeth. Can be used on Model 320-B. Slightly Used but excellent condition. D-6.

DRAGLINE BUCKETS

BRAND NEW

2 ¾ CU. YD. PAGE CLASS "C." Approximate weight each 2425 lbs. DB-1

1 1½ CU. YD. PAGE CLASS "C." Approximate weight 4540 lbs. DB-3

3 2 CU. YD. PAGE CLASS "C." Approximate weight each 5630 lbs. DB-4

1 2 CU. YD. OMAHA STANDARD. Approximate weight 4300 lbs. DB-5

REBUILT

1 1¾ CU. YD. OMAHA STANDARD. Approximate weight 3800 lbs. DB-7

1 2 CU. YD. BUCYRUS-ERIE TYPE "U" RED ARCH. Approximate weight 3700 lbs. DB-8

1 2½ CU. YD. BUCYRUS-ERIE INSERTED TOOTH. Approximate weight 6500 lbs. DB-9

1 2½ CU. YD. OMAHA STANDARD. Approximate weight 5400 lbs. DB-10

BOILERS

BRAND NEW

Will Make That Old Shovel Work Like New.
Can Also Be Used for Miscellaneous Service.

Vertical Type

6 36"x82½"—26 H.P.—142 lb. Working Pressure. Mass. Std. Will fit Type A. B-1.

3 42"x88"—35 H.P.—144 lb. Working Pressure. Mass. Std. Will fit Type B Shovel. B-2.

1 44½"x88½" fitted with extended fire box for burning wood. Can be used for coal or coke. 37 H.P.—144 lb. Working Pressure. ASME Std. Can be installed on Type B Shovel. B-3.

1 44½"x88½"—37 H.P.—145 lb. Working Pressure—Canadian Standard. Will fit B or B-2. B-4.

1 46½"x88½"—37 H.P. 150 lb. Working Pressure. Canadian Standard. Will fit any B-2 or B-3 Machine. B-7.

1 46½"x88½"—37 H.P.—150 lb. Working Pressure. Mass. Std. Will fit B-2 or B-3. B-8.

3 48½x110"—40 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

1 54"x100"—41 H.P.—125 lb. Working Pressure. ASME Std. Will fit B-2 or B-3. B-11.

1 58"x7'9"—70 H.P.—150 lb. Working Pressure. Mass. Std. Will fit 42-B Machine. B-12.

Locomotive Type

3 44"x17'—75 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-13.

1 44"x18'—88 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 70-C. B-14.

1 54"x9'7"—70 H.P.—125 lb. working pressure —ASME and Canadian standard. Will fit Model 50-B machine. B-15.

2 54"x11'3"—92 H.P.—125 lb. Working Pressure. ASME and Mass. Std. Will fit Model 50-B Machine. B-16.

ELECTRICAL EQUIPMENT

MOTOR—GENERAL ELECTRIC—3 phase, 25 cycle, 550 volt, 1500 RPM., 90 HP., BRAND NEW. EE-1.

50 KW MOTOR GENERATOR SET—GENERAL ELECTRIC—consisting of 3 phase, 60 cycle, 440 volt, 1170 RPM., 75 HP., Induction Motor connected to 50 KW, 250 volt, 1200 RPM., Generator, including suitable rheostat and compensator. BRAND NEW. EE-2.

COMPENSATOR—GENERAL ELECTRIC—75 HP., 2200 volt, 3 phase, 25 cycle, manual type. BRAND NEW. EE-3.

TRANSFORMER—GENERAL ELECTRIC — 5-KVA. 2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. BRAND NEW. EE-4.

GENERATOR — WESTINGHOUSE — 125 KW, 250 volts, 500 amperes. Direct Current. 440 RPM. Includes two outboard bearings. BRAND NEW. EE-5.

MOTORS (2) — GENERAL ELECTRIC — 21.5 H.P. 3 phase, 60 cycle, 440 volt, 900 RPM. Totally enclosed—ball bearing. BRAND NEW. EE-6.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure, A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M. — Overall dimensions: — Height 45"—Length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Brand New. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressor with fittings. Used. Make offer. AC-2.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2 BRAND NEW NON-REVERSIBLE ATLAS DIESEL ENGINES—4 cylinder, 7" bore x 8½" stroke, 75 HP at 600 RPM, 4 cycle, Vertical—valve in head type. Includes radiator, fan and air cleaners. DE-1.

2 BRAND NEW NON-REVERSIBLE ATLAS DIESEL ENGINES—5-cylinder, 9" bore x 10½" stroke, 150 HP at 450 RPM, 4 cycle, Vertical—valve in head type. Dust proof, Oil tight crank case and forced lubricating system. Also auxiliary air starting equipment. DE-2.

4 BRAND NEW NON-REVERSIBLE ATLAS DIESEL ENGINES—3-cylinder 6" bore x 8" stroke, 45 H.P. at 650 R.P.M., 4 cycle, Vertical—valve-in-head type. DE-5.

3 BRAND NEW NON-REVERSIBLE ATLAS DIESEL ENGINES—4-cylinder, 6" bore x 8" stroke, 60 HP. at 650 RPM. DE-6.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 HP at 400 RPM. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 HP at 400 RPM. 100 lb. Pressure. ME-3.

2 5"x5" reversible —25.6 HP at 400 RPM. 100 lb. Pressure. ME-4.

1 "LITTLE TUGGER" INGERSOLL RAND STEAM HOIST ENGINE No. 1-H-5-2½ H.P. ME-5.

PUMPS

1 NB—3 STAGE CENTRIFUGAL PUMP—2" suction and discharge — bronze impeller and shaft—capacity 100 gallons per minute at 240' head operating at 1720 RPM or 270' head at 1780 RPM. Now equipped for belt drive but can be operated by 15 HP Electric Motor. ME-6.

SOLID RUBBER TIRES

FOUR—40"x8" "HOOD" solid rubber heavy duty—Used for demonstration only—Good as new—Price very reasonable. RT-1.

Address all inquiries to Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.

Book Reviews

Strength of Flat-Arch Floor Construction, Part I, End Spans, by G. E. Large and C. T. Morris, department of civil engineering, Ohio State University, Columbus, Ohio, has recently been published by the University as Bulletin 78 of the Engineering Experiment Station. Price 50 cents.

Azimuth Determination is the title of a bulletin by E. F. Coddington, professor of civil engineering, Ohio State University, Columbus, Ohio. It is divided into four major parts: A discussion of the celestial sphere and of the methods of computing time, determination of azimuth from the sun, azimuth determination from the North Star, and an appendix containing the tables of values required for the work to the year 2000. No mathematics higher than trigonometry are required for use of the book. Published by the University as Bulletin 79 of the Engineering Experiment Station. Price 50 cents.

Two interesting fully illustrated booklets, describing development and creation of water areas in cities or rural localities, for use primarily as small wild waterfowl refuges but adaptable to recreational, park and ornamental purposes as well, are available free of charge upon application to **More Game Birds in America, Inc.**—A Foundation, 500 Fifth Avenue, New York, N. Y. The booklet **Small Refuges for Waterfowl** describes existing municipal, state and private refuges in widely separated sections of the country and how they were constructed by excavating, damming, blasting and other means. The booklet **Water Areas—How to Create and Maintain Them,** describes simple methods of building small earth, rock and concrete dams of various types, earthen reservoirs and methods of developing water supplies to flood the ponds.

Procedure Handbook of Arc Welding Design and Practice has recently been revised by the Lincoln Electric Company, Cleveland, Ohio. It is 5¾x9 inches, contains 450 pages and is priced at $1.50 (foreign postage 50c extra). Publication of the book is especially for designers, engineers, welding operators, welding foremen and for engineers responsible for the design of products which may be redesigned for welding construction. It covers practically every use and application of arc welding, is encyclopedic in scope and is profusely illustrated.

Hughes-Keenan Company, Mansfield, Ohio has issued an illustrated four page bulletin on their **Iron Mule** which they characterized as "dirt moving gluttons". A copy of this bulletin which includes general specifications, will be sent to any interested reader.

Trade Notes

Mr. C. A. Clark, for the past four years president of Clark & Burrows, Inc. of Dallas, Texas has rejoined the staff of the **Portland Cement Association** as Assistant Manager of the Highways & Municipal Bureau. Prior to entering the construction equipment business, Mr. Clark was for thirteen years with the Portland Cement Association as field engineer, district engineer, and finally as regional manager in charge of Southwestern territory.

Ingersoll-Rand Company recently acquired the turbo-blower business of General Electric Company, including an exclusive license under the various General Electric patents, and will consolidate it with its own turbo-blower department. This acquisition places Ingersoll-Rand in position to meet demands for blowers and centrifugal type compressors for the broadest possible variety of uses. Ingersoll-Rand is a long-established manufacturer of blowers of medium and large capacities, for pressures ranging up to 100 lbs. General Electric has specialized in both single and multi-stage units for a variety of services in low and medium pressures.

Intermountain Equipment Company, Boise, Idaho, has been appointed exclusive distributor for the Rex line of construction equipment by Chain Belt Company, Milwaukee, Wisconsin.

The Doman-Marks Engine Co., Amesbury, Mass., manufacturers of direct air-cooled engines, are now producing three horizontal engines known as Models 6AH-309, 6AH-377 and 6AH-400. These develop 85, 104 and 111 horsepower respectively at 2600 R.P.M. The special features are air cooling and a maximum over-all height of 26".

POSITIONS WANTED

Positions wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00. Advertisements for help wanted free of charge.

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

MINE STRIPPING FOREMAN OR SUPERINTENDENT

Twenty-four years experience in the rock and dirt moving business. Have had experience with all classes of dirt moving equipment, also handling of explosives. Know costs as well as how to increase production. Can furnish best of references from former positions that I have held as to my ability with handling stripping operations as well as costs. Box 6401.

ENGINEER — ESTIMATOR — SUPERINTENDENT

Thirty years experience general superintendent, estimator, contractors engineer. Twenty years highways and bridges. Anywhere. Preference New England. Box 6400.

EXPERT DRAGLINE AND SHOVEL OPERATOR

16 years' experience as shovel operator. Married, 36 years of age. Have operated practically all makes of machines, and have 10 years' experience as dragline operator. Can handle steam, Diesel, electric or gasoline machine. Have worked on highway and railroad grading, rock excavation in quarry, drainage and irrigation and dredging and also gold dredging. Prefer position on Bucyrus-Erie E-2, D-2, or 50-B or other Bucyrus-Erie machines. Have also operated Class 220 and 225 electric and Diesel electric machines. Capable of taking charge of repairing and erecting and can handle crews. Best of references and can do own repairing. At present located in California, but will go anywhere. Box 5507.

ENGINEER-SUPERINTENDENT WANTS CONNECTION WITH CONTRACTOR

Twenty years' exceptional experience in factory construction, rock work, roads, dams, tunnels, hydro-electric developments, foundations. Has produced results under difficult conditions and can handle large program in whole or part. Eight years Latin America. Go anywhere. Box 5102.

SUPERINTENDENT

20 years operating and in charge of heavy strip mine and quarry equipment. 45 years of age. Can furnish references from any former employer and the largest manufacturer of excavating equipment in America. Can take full charge on reasonable notice. Box 5901

OPERATOR-QUARRY FOREMAN

Have 25 years experience operating steam, electric and gasoline shovels and draglines on all classes of work. Can do own repair work. Also experienced quarry foreman with very best references. Married but willing to go anywhere. Present location Kentucky. Box 6200.

EXPERIENCED DRAGLINE OPERATOR

Fifteen years' experience on Bucyrus-Monighan, P&H, Northwest and other makes of Steam, Diesel, gas and electric draglines on levee work and phosphate mines. Hold three sets civil service papers with ratings of 70%, 85%, and 100%. Married but can go anywhere. Furnish excellent references. Present location, Louisiana. Box 5903

OPERATOR

Thirty years experience on coal stripping, railroad and highway construction. Prefer coal stripping anywhere. Can do own repair work and furnish best of references. Married. Present location, Pennsylvania. Box 6501.

SHOVEL OPERATOR

14 years' experience on railroad, highway and coal stripping. Prefer big coal stripper. Can do own erecting and repairing. Willing to go anywhere on short notice. Can furnish best of references. Present location Alabama. Box 6300

OPERATOR

Nine years' experience on Bucyrus-Erie 37-B, 50-B and E-2 Diesel and gasoline powered. Also on Northwest and P&H machines. Can do own repair work and handle any class of work. References. Box 6301

DRAGLINE OPERATOR

13 years' experience operating steam, gasoline and Diesel draglines and clamshells on levee and drainage projects. Can do own repair work and furnish A-1 references. Single and willing to go anywhere. Present location Iowa. Box 6302

GAS OR STEAM SHOVEL OPERATOR

7 years' experience on cutting slopes, gradings and highway construction, not afraid of work. Would like a position on any type of small machine anywhere in the U.S.A. Can do his own repair work and furnish good references. Box 6500.